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LOST! AMPHIBIANS OF INDIA

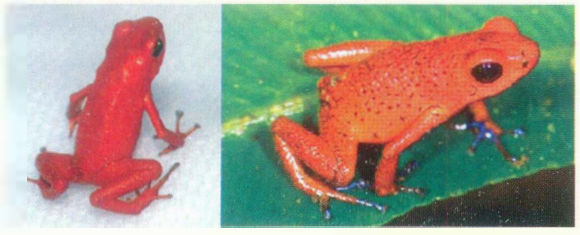
Most Poisonous Frogs

Frogs are animals of zoological class that is called Amphibian. These are cold blooded vertebrate animals. They have a difference from reptiles because they lack scales and generally live in water.There are many types of frogs found all over the world. It mostly characterized by color. Some frogs can adjust their color according to weather and temperature.

What a fantastic frogs you have never seen yet. See the wonderful view of different colorful and amazing frogs of the world. But these frogs can be dangerous. Here you can learn about harmful and deadly poisonous frogs.

Strawberry Poison Dart Frog

These kinds of frogs have bright red skin. They are mostly found in Central America. These kinds of frogs are very dangerous for humans.It gets poison from eating mites. According to the latest research that rather than ants as was previously thought it is different species of the minuscule which are found in the frog's skin. The main cause of poison in the frog are mites.



Splash-backed Poison Frog

It has black and white skin. It is found in rainforest of Ecuador and Peru. It has very dangerous poison in its skin to be capable of killing five humans in one bite. It looks as a nice and beautiful frog but it is a very harmful frog of the world.

Golden Poison Frog

It is a deadly poison frog of the world. It is found in Netherlands and can kill up to 20 people and two big elephants of Africa.The human will die if he even touches that. It's poison attack direct on the heart.

Phantasmal Poison Frog

This harmful frog is tiny but has a toxicity that belies its size. Its poison can easily kill animals and also humans.

Dyeing Dart Frog

This use poison for self defense and it comes in different colors. It is the third largest frog of poison frogs. The poison of this frog is also used by tribes for hunting purpose.

Red-backed Poison Frog

It is looks like a tiny and wondrous frog and also does serious injury to humans and has a power of poison to kill animals. It has a great defense against any enemy. Its poison is very dangerous as that of a big snake.

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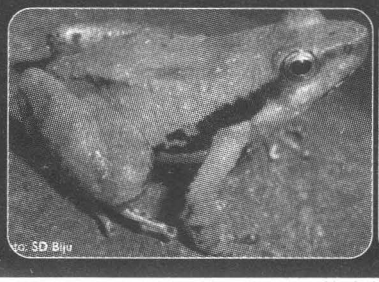

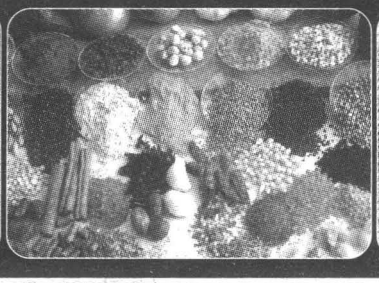

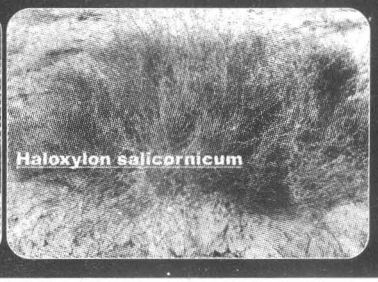

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Mail to:

SCIENCE INDIA
Sastra Bhavan, B4, 4th Floor, Mather Square
Town Railway Station Road, Kochi - 682 018
Ph: 0484 - 2393242, 2393256 Fax: 2393256
E-mail: scienceindia2010@gmail.com
www.scienceindia.in

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Editorial

The University of Delhi is joining hands with Global Wildlife Conservation, the Natural History Museum (London), the IUCN/SSC Amphibian Specialist Group, the Wildlife Conservation Society, and Conservation International in an exciting new partnership to search for long lost amphibian species in India.

India has more lost amphibian species, 48 in total, than any other country in the world. Most of these species have not been seen by scientists for decades, with some missing for over 150 years. The majority of these species are known only by a single preserved specimen in a jar at either the Natural History Museum in London or the Zoological Survey of India. Worse yet, at least 17 lost species exist in name only, having been lost over the past century.

LOST! AMPHIBIANS OF INDIA aims to change this by organizing top teams of researchers from India and around the world to explore India's remaining wilderness areas, in order to relocate existing populations of these amphibians and assess their conservation requirements. Many of the sites are remote and present the hazards of rugged terrain and monsoon rains. However if the effort to find them is not made now, their habitats may be lost before appropriate conservation actions can be implemented. Only 1.5% of the original forests remain in the Western Ghats and several species are already thought to be extinct; many other parts of the country have even worse habitat loss.

"Amphibians are popularly known as environmental barometers. They indicate the state of environmental health. Hence any information about their conservation is extremely vital not only from an amphibian research point of view but also from the perspective of overall nature conservation," explains Delhi University Associate Professor Dr. S.D. Biju, who is organizing the LAI project.

The Cover Story of this issue of Science India is "Lost! Amphibians of India"

Team Science India

LOST! AMPHIBIANS OF INDIA

The 'Lost Amphibians of India' initiative is slated to close in a couple of months. India could well become the first country to have a conservation programme for amphibians including frogs. With the 'Lost Amphibians of India' initiative researchers are now putting together a large-scale project on the need to conserve Indian frogs, which would be submitted to the government for approval.

Spearheaded by a team of field biologists from Delhi University, the unique initiative was formally launched in a function at University of Delhi on 2 November 2010 to find out whether 52 amphibian species had vanished from India. The associates are Global Wildlife Conservation, the Natural History Museum (London), the IUCN/SSC Amphibian Specialist Group, the Wildlife Conservation Society, and Conservation International.

Many of these species are seen only inside spirit jars or known to researchers through sketchy descriptions in text books. Amphibians are popularly known as environmental barometers. They indicate the state of environmental health. Globally, there are 6,000 species of amphibians, out of which 2,000 are endangered.

The list of the most wanted species include frogs and tiny snake-like caecilians. The oldest in the list is a frog, seen last in undivided Bengal in 1834, while the youngest is a caecilian that was spotted till 1992 in Kerala's Chegalam village. As many as eight frog species were last seen in Karnataka. After a year of search in 17 states involving 280 members from 20 teams, the frog-hunters identified almost 70 per cent of the species. The oldest one is a species last seen in 1874.

Out of the 52 lost amphibians, nine species were last seen between 100-177 years whereas 26 animals were spotted between 50-100 year ago. Other 17 lost species are relatively new as they were last spotted within the previous 50 years. The frog species are now being rediscovered in Darjeeling, Hassan and Silent Valley in Kerala among other locations.

Five species in Karnataka

Within three months of launching the operation, five species were found including one from Karnataka. It is an elegant tropical frog (*Micrixalus elegans*), known to scientists from an original description based on a collection in 1937. The original specimen was lost till it was rediscovered by field biologists in a forest stream-bed in Kempholey in Hassan district.

The most vintage of the five was a green species that was last seen in 1874. Rediscovered from Kodayar in Tamil Nadu after 136 years, the striking fluorescent green frog with ash-blue thighs and black pupils with golden patches leads a

secretive life, presumably inside reeds during the day.

India currently has 317 known species of amphibians - 283 frogs (order Anura), 33 caecilians (Gymnophiona) and one salamander (Caudata). Out of these 300 odd species, 168 are found in the Western Ghats with 146 endemic species, which means these animals are not found anywhere in the country except the Western Ghats. Kerala too has 40 endemic species though 100 frogs and 12 caecilian species are found in the Kerala forests.

"Since 2000, more than 90 frogs have been discovered, 28 per cent of which are Indian species," said K.V. Gururaja, a frog researcher at Indian Institute of Science, Bangalore. A search by the IISc team in four protected forests of Karnataka - Dandeli-Anshi, Kudremukh, Sharavathi and Bhadra - revealed presence of 25 species, 16 of which are endemic. "It shows the importance of conservation even outside the protected ares".

Rampant habitat loss, forest fires, road kills, pesticide use, commercial interests, introduction of alien species and diseases are pushing the hapless frogs to extinctions. While Indian forest officials are conservationists and are familiar with the first six causes, its the seventh factor that may spell trouble for the frogs, big time.

Gururaja and his colleagues spotted fungal infections in frogs in Dandeli. This is the first case of finding out fungal infections in frog species - which could be potentially devastating - in India. But since the team could not identify the infection on the frog skin due to a contaminated sample, the scientists are not sure if it was a case of deadly Chytrid infections.

According to the OIE (World Organisation for Animal Health) both Chytridiomycosis and Rana-viral diseases are notifiable diseases, which can bring disaster among the frogs. Habitat loss too is another big worry. Habitat change in the next 10-20 years will take place in the same area where amphibian species diversity exists. For instance 95 percent of rain forest is lost in Sri Lanka. This means that many of the 100 known Sri Lankan frog species are probably extinct.

Globally almost one third of known amphibian species are facing extinction. Among the vertebrates, they are the most threatened. But we need to preserve them as they are indicators of the environment.

PROJECT FOR FROG CONSERVATION

LOST! AMPHIBIANS OF INDIA aims to change this by organizing top teams of researchers from India and around the world to explore India's remaining wilderness areas, in order to relocate existing populations of these amphibians and assess their conservation requirements. Many of the sites are remote and present the hazards of rugged terrain and monsoon rains. However if the effort to find them is not made now, their habitats may be lost before appropriate conservation actions can be implemented. Only 1.5% of the original forests remain in the Western Ghats and several species are already thought to be extinct; many other parts of the country have even worse

habitat loss.

In preparation for finding species in need of swift conservation action, LOST! AMPHIBIANS OF INDIA is simultaneously initiating discussions to develop the Western Ghats Network of Protected Areas for Threatened Amphibians (WNPATA; www.wnpata.org). Protecting the amphibian habitats of India will also benefit communities who depend on forests for the provision of freshwater, erosion control, and sources of livelihood.

The LOST! AMPHIBIANS OF INDIA campaign is therefore not only a last chance to save some of the planet's most endangered wildlife, but it will also focus attention on remote, rural communities in India and how they depend on the integrity of the environment for its provision of natural resources. Saving lost amphibians will impact more than just the species that are the targets of exploration, but also entire unique ecosystems and the people that depend on them. But to save them, first we have to find them. The quest has begun.

THE 'HIT LIST'

The 48 lost amphibians are listed below. Some of the species currently in the list are only potentially lost species and would require further taxonomic study. The rediscovery of these lost named populations will allow taxonomists to finally establish whether these taxa are indeed valid species, or if they should be synonymised with other known species. "Last seen" mentioned for each species is calculated from the date of collection, if available. If the collection date is not available then the publication date is considered for "Last seen".

1 *Duttaphrynus peninsularis*
2 *Ghatophryne rubigina*
3 *Euphlyctis ghoshi*
4 *Fejervarya assimilis*
5 *Fejervarya brama*
6 *Fejervarya murthii*
7 *Fejervarya parambikulamana*
8 *Fejervarya sauriceps*
9 *Limnonectes khasianus*
10 *Limnonectes mawlyndipi*
11 *Sphaerotheca leucorhynchus*
12 *Ingerana charlesdarwini*
13 *Micrixalus elegans*
14 *Micrixalus narainensis*
15 *Micrixalus silvaticus*
16 *Micrixalus swamianus*
17 *Micrixalus thampii*
18 *Ramanella anamalaiensis*
19 *Ramanella minor*
20 *Ramanella montana*
21 *Amolops chakrataensis*
22 *Amolops jaunsari*
23 *Hylarana bhagmandlensis*
24 *Hylarana intermedius*
25 *Hylarana montanus*
26 *Indirana longicrus*
27 *Indirana tenuilingua*
28 *Chiromantis shyamrupus*
29 *Raorchestes chalazodes*
30 *Raorchestes flaviventris*
31 *Raorchestes dubius*
32 *Raorchestes jerdonii*
33 *Raorchestes kempii*
34 *Raorchestes microdiscus*
35 *Raorchestes montanus*
36 *Raorchestes sanctisilvaticus*

37 *Raorchestes sahai*
38 *Raorchestes terebrans*
39 *Theloderma moloch*
40 *Xenophrys monticola*
41 *Scutiger occidentalis*
42 *Ichthyophis husaini*
43 *Ichthyophis longicephalus*
44 *Uraeotyphlus interruptus*
45 *Uraeotyphlus malabaricus*
46 *Uraeotyphlus menoni*
47 *Uraeotyphlus oommeni*
48 *Uraeotyphlus oxyurus*

1. Original name: *Bufo stomaticus peninsularis*; Original Publication: Rao, 1920, *J. Bombay Natural History Society* **27:** 126.

   Last seen: 1920 (90 years): Only from the original description based on one specimen.

   Type locality: "Mavkote and Watekille, Coorg" approximately 12°06' N, 75°47' E, 1100 m a.s.l., Karnataka, India.

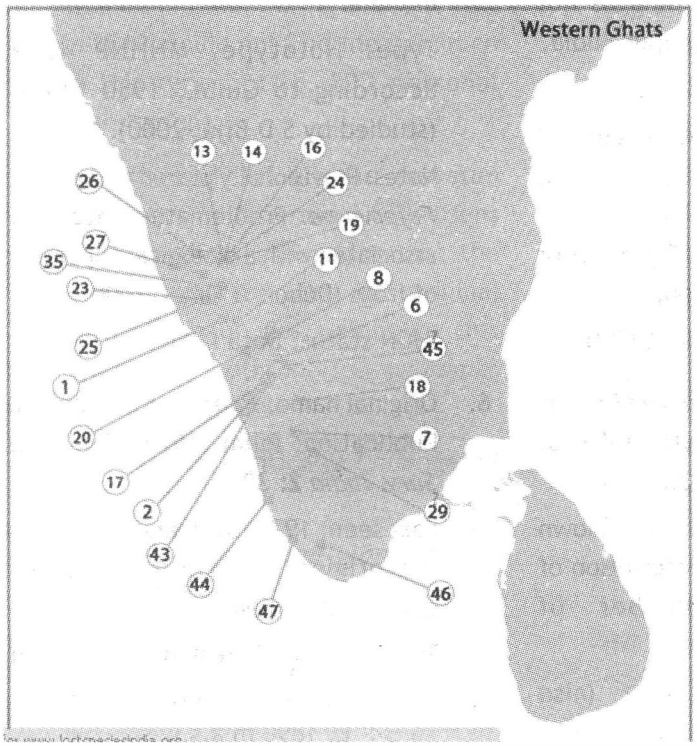
   Type: Holotype, ZSIC 19176.

   Notes: This taxon is currently considered the same species as *Duttaphrynus stomaticus*. Type specimen is damaged and further taxonomic and molecular studies are necessary to verify its status (SDB, unpublished).

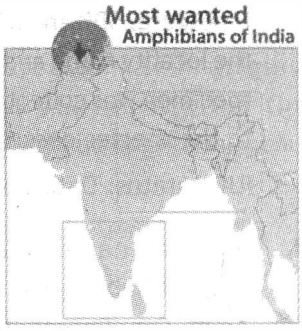
   IUCN status: Not evaluated.

2. Original name: *Ansonia rubigina*; Original Publication: Pillai and Pattabiraman, 1981, *Proc. Indian Acad. Sci., Ser. B.*, **90:** 203.

   Last seen: 1981 (29 years): Only from the original description based on a single specimen.



REDISCOVERY



Type locality: "Kummattan Thodu", a tributary of River Kunthi, Silent Valley, approximately 11°13' N, 76°28' E, alt. 1000 m a.s.l., Kerala, India.

Type: Holotype, ZSI-SRS VA/775.

Notes: Study of all the museum specimens (and personal collections of researchers), indicates that the species reported after the original publication do not belong to this species (SDB, unpublished data).

IUCN status: Vulnerable (VU).

3. Original name: *Rana ghoshi*; Original Publication: Chanda, 1990, *Hamadryad* **15:** 16-17.

Last seen: 1975 (35 years): Only from the original description based on a single specimen.

Type locality: "Khugairk Reserve Forest, Manipur", coordinates not known, 925 m a.s.l., Manipur, India.

Type: Holotype, ZSIC A8472.

Notes: The locality name "Khugairk" is obscure. SDB and RGK tried to trace the locality name and failed. The type specimen was collected 15 years prior to the species description.

IUCN status: Data Deficient (DD)

4. Original name: *Rana assimilis*; Original Publication: Blyth, 1852, *J. Asiat. Soc. Bengal*, **21:** 355.

Last seen: 1852 (158 years): Known only from the original description of an unmentioned number of specimens.

Type locality: "Calcutta . . . (also inhabiting Arakan)", now Kolkata, 22°34' N, 88°22' E, 13 m a.s.l., West Bengal, India.

Type: Holotype, never designated, presumed to be LOST

Notes: Currently considered a member of the genus *Fejervarya*, but not associated with a living population.

IUCN status: Data Deficient (DD).

5. Original name: *Rana brama*; Original Publication: Lesson, 1834, In: Bélanger (Ed.), Voy. Indes-Orientales N. Eur. Caucase Georgie Perse, Zool.: 329

Last seen: 1834 (176 years): Only from original description and type specimen.

Type locality: "Bengale" now constitutes Bangladesh and West Bengal, Orissa, Jharkhand and Bihar in India.

Type: Holotype, MNHNP 4899, according to Guibé, 1950 "1948" (studied by S D Biju, 2000).

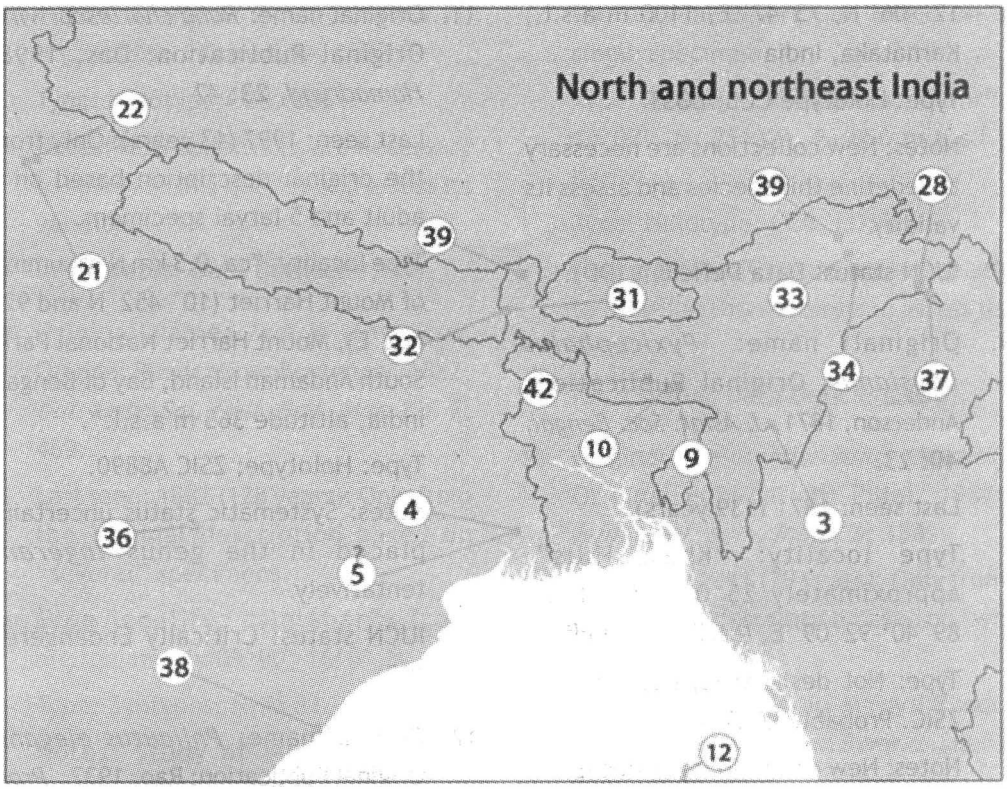
Notes: Provisionally placed in the genus *Fejervarya*. Problematic status, not associated with a biological population of frogs (Dubois & Ohler, 2000).

IUCN status: Data Deficient (DD).

6. Original name: *Rana murthii*; Original Publication: Pillai, 1979, *Bull Zool. Surv. India* **2:** 39.

Last seen: 1979 (31 years): Only from the original description based on several specimens.

Type locality: "Forest at Naduvattom, Gudallur, Tamil Nadu", 11°28' N, 76°34' E, 1890 m a.s.l.



Type: Holotype, ZSI-SRS VA/773 (SDB studied in 2000. During a recent visit in 2010, could not find the specimen in the type bottle, SDB personal observation).

Notes: Study of all the museum specimens (and personal collections of researchers), indicates that the species reported after the original publication do not belong to this species. Currently only four paratypes remain at ZSI-SRS.

IUCN status: Critically Endangered (CR).

7. Original name: *Rana* (*Tomopterna*) *parambikulamana*; Original Publication: Rao, 1937, *Pro. Indian Acad. Sci., Ser. B*, **6:** 391

Last seen: 1937 (73 years): Only from the original description based on a single specimen.

Type locality: "Parâmbikulam forests", 10°22' N, 76°49' E, 1000 m a.s.l., Kerala, India.

Type: Holotype CCB, LOST

Notes: Based on the original description and illustration this species probably belongs to the genus *Fejervarya*.

IUCN status: Data Deficient (DD)

8. Original name: Rana (*Hylarana*) *sauriceps*; Original Publication: Rao, 1937, *Pro. Indian Acad. Sci., Ser. B*, **6:** 396

Last seen: 1937 (73 years): Only from the original description based on 'several specimens'.

Type locality: "Wattekole, Coorg",

12° 06' N, 75°47' E, 1100 m a.s.l., Karnataka, India

Type: Holotype CCB: LOST

Notes: New collections are necessary to redefine this species and assess its validity.

IUCN status: Data Deficient (DD).

9. Original name: *Pyxicephalus khasianus*; Original Publication: Anderson, 1871, *J. Asiat. Soc. Bengal*, **40:** 23.

Last seen: 1871 (139 years).

Type locality: "Khasi Hills", approximately 25°07'-26°00' N, 89°40'-92°09' E, Meghalaya, India.

Type: Not designated, deposited at ZSIC. Probably LOST

Notes: New collections are necessary to redefine this species and assess its validity.

IUCN status: Data Deficient (DD)

10. Original name: *Rana* (*Tomopterna*) *leucorhynchus*; Original Publication: Rao, 1937, *Proc. India Acad. Sci., Ser. B*, **6:** 392.

Last seen: 1937 (73 years): Only from the original description based on one specimen.

Type locality: "Wattakole, Coorg", 12°06' N, 75°47' E, 1100 m a.s.l., Karnataka, India.

Type: Holotype, CCB, LOST.

Notes: Based on the original description and illustration this species probably belongs to the genus *Sphaerotheca.*

IUCN status: Data Deficient (DD)

11. Original name: *Rana charlesdarwini*; Original Publication: Das, 1998, *Hamadryad*, **23:** 42

Last seen: 1997 (13 years): Only from the original description based on 3 adult and 5 larval specimens.

Type locality: "ca. 0.3 km N of summit of Mount Harriet (10° 452 N and 92° 462 E), Mount Harriet National Park, South Andaman Island, Bay of Bengal, India, altitude 365 m a.s.l.".

Type: Holotype: ZSIC A8890.

Notes: Systematic status uncertain, placed in the genus *Ingerana* tentatively.

IUCN status: Critically Endangered (CR)

12. Original name: *Philautus elegans*; Original Publication: Rao, 1937, *Proc. Indian Acad. Sci., Ser. B*, **6:** 407.

Last seen: 1937 (73 years): Only from the original description based on an unknown number of specimens.

Type locality: "Kempholey, Hassan" 13°03'N, 75°53'E, 880 m a.s.l., Hassan dist., Karnataka, India.

Type: Holotype, CCB, LOST

Notes: New collections are necessary to redefine this species and assess its validity.

IUCN status: Data Deficient (DD)

13. Original name: *Philautus narainensis*; Original Publication: Rao, 1937, *Proc. Indian Acad. Sci., Ser. B*, **6:** 413.

Last seen: 1937 (73 years): Only from the original description based on an unknown number of specimens.

Type locality: "Kottigehar, Kadur"

13°07'N, 75°37'E, 850 m a.s.l., Hassan dist., Karnataka, India.

Type: Holotype,CCB, LOST.

Notes: New collections are necessary to redefine this species and assess its validity.

IUCN status: Data Deficient (DD).

14. Original name: *Ixalus silvaticus*; Original Publication: Boulenger, 1882, *Cat. Batr. Sal. Coll. Brit. Mus. Ed.* **2:** 469.

Last seen: 1882 (128 years): Only from the original description based on "several" specimens.

Type locality: "Malabar", from approximately 09°00'-16°5' N.

Type: Syntypes, NHM 82.2.10.52-59.

Notes: Study of all the museum specimens (and personal collections) indicates that the species reported after the original publication do not belong to this species (SDB unpublished data).

IUCN status: Data Deficient (DD).

15. Original name: *Philautus swamianus*; Original Publication: Rao, 1937, *Proc. Indian Acad. Sci., Ser. B*, **6:** 409.

Last seen: 1937 (73 years): Only from the original description based on a single specimen.

Type locality: "Kottigehar, Kadur", 13°07' N, 75°37' E, 850 m a.s.l., Karnataka, India.

Type: Holotype, CCB, LOST.

Notes: New collections are necessary to redefine this species and assess its validity.

IUCN status: Data Deficient (DD).

SILENT VALLEY TROPICAL FROG: *Micrixalus thampii*

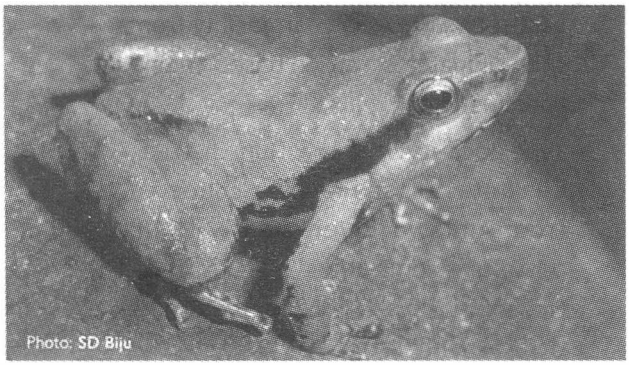


Photo: SD Biju

16. Original name: *Micrixalus thampii*; Original Publication: Pillai, 1981, *Bull. Zool. Surv. India*, **3:** 153.

Last seen: 1981 (29 years): Only from the original description based on two specimens.

Type locality: "Madiri Mavam Thodu tributary of the Kunthi River.....Silent Valley", 11°10' N, 76°22' E, Kerala, India.

Type: Holotype, ZSI-SRS VA/778, probably LOST.

Notes: Study of all the museum specimens (and personal collections) indicates that the species reported after the original publication do not belong to this species (SDB unpublished data).

IUCN status: Data Deficient (DD).

17. Original name: *Ramanella anamalaiensis*; Original Publication: Rao, 1937, *Proc. Indian Acad. Sci., Ser. B.* **6:** 420.

Last seen: 1937 (73 years): Only from the original description based on a single specimen.

Type locality: "Base of Anamalai Hills, Coimbatore District" approximately

10°12' N, 76°24' E, 1000 m a.s.l., Tamil Nadu, India.

Type: Holotype, CCB, LOST.

Notes: New collections are necessary to redefine this species and assess its validity.

IUCN status: Data Deficient (DD).

18. Original name: *Ramanella minor*; Original Publication: Rao, 1937, *Proc. Indian Acad. Sci., Ser. B.* **6:** 417.

Last seen: 1937 (73 years): Only from the original description based on a single specimen.

Type locality: "Saklespur, Hassan", 12°58' N, 75°46' E, 840 m a.s.l., Karnataka, India.

Type: Holotype, CCB, LOST.

Notes: New collections are necessary to redefine this species and assess its validity.

IUCN status: Data Deficient (DD).

19. Original name: *Hylaedactylus montanus*; Original Publication: Jerdon, 1854, *J. Asiat. Soc. Bengal*, **22:** 533.

Last seen: 1854 (156 years): Only from the original description based on a single specimen.

Type locality: "Mountain streams in Wynaad" 11°26'-11°48' N and 75°46'-76°26' E, 800-1500 m a.s.l., Kerala, India.

Type: Holotype, ZSIC, LOST.

Notes: New collections are necessary to redefine this species and assess its validity and distribution.

IUCN status: Near Threatened (NT).

20. Original name: *Amolops chakrataensis*; Original Publication: Ray, 1992. *Indian J. Forestry*, **15(4):** 346.

Last seen: 1985 (25 years): Only from the original description based on one specimen.

Type locality: "Dehra Dun district, Chakrata, Uttar Pradesh from a hill stream, 14 km northwest of Chakrata on Tuni road", 30°42′8.8"N, 77°53′33.2"E, 1366 m a.s.l., now Uttarakhand, India.

Type: Holotype, NRS/ZSI, A-197.

Notes: Collected seven years prior to description. New collections are necessary to redefine this species and assess its validity and distribution.

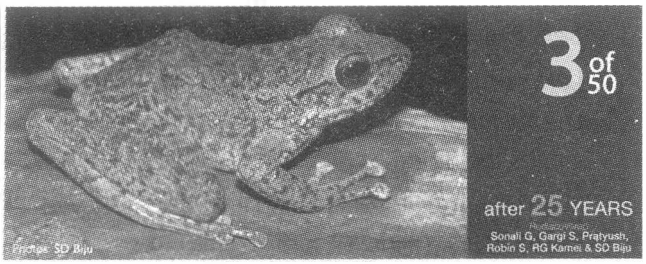
IUCN status: Data Deficient (DD).

21. Original name: *Amolops jaunsari*; Original Publication: Ray, 1992, *Indian J. Forestry*, **15(4):** 348.

Last seen: 1985 (25 years): Only from the original description based on one specimen.

Type locality: "Dehra Dun district, Chakrata, Uttar Pradesh; collected from Amlawa River, nearly 2 km upstream from Sahiya", 30°36′54.7" N, 77°52′24.6" E, 1062 m a.s.l., now Uttarakhand, India.

DEHRADUN STREAM FROG: *Amolops chakrataensis*



Type: Holotype, NRS/ZSI, A-196.

Notes: Collected seven years prior to description. New collections are necessary to redefine this species and assess its validity and distribution.

IUCN status: Data Deficient (DD).

22. Original name: *Rana* (*Hylorana*) *bhagmandlensis*; Original Publication: Rao, 1922, *J. Bombay Nat. Hist. Soc.* **28:** 441.

Last seen: 1921 (89 years): Only from the original description based on two specimens.

Type locality: "Water course in the forests of Bhagamandla, Coorg, 4000 feet" approximately 12°24' N, 75°31' E, 840 m a.s.l., Karnataka, India.

Type: Holotype, NHM 1947.2.2.12.

Notes: Dutta (1990) designated BM 1947.2.2.12 as lectotype. Dubois (1992) not accepted, synonymised (without discussion) as *Hylarana aurantiaca*. Type specimen registered at NHM in 1921 (collected more than 89 years ago)

IUCN status: Vulnerable (VU).

23. Original name: *Rana* (*Hylorana*) *intermedius*; Original Publication: Rao, 1937, *Proc. Indian Acad. Sci. Ser., B.* **6:** 394.

Last seen: 1937 (73 years): Only from the original description based on a single specimen.

Type locality: "Saklespur, Hassan District, Mysore State", 12°58' N, 74°42' E, 840 m a.s.l., Karnataka, India.

Type: Holotype, CCB, LOST.

IUCN status: Near Threatened (NT).

24. Original name: *Rana* (*Hylorana*) *gracilis montanus*; Original Publication: Rao, 1922, *J. Bombay Nat. Hist. Soc.*, **28:** 439.

Last seen: 1922 (88 years): Only from the original description based on two specimens.

Type locality: "Hill forests of Bhagamandla",12°24' N, 75°31' E, 840 m a.s.l., Karnataka, India.

Type: Holotype, NHM 1921.1.20.6; paratype NHM 1921.1.20.7.

IUCN status: Near Threatened (NT).

25. Original name: *Philautus longricrus*; Original Publication: Rao, 1937, *Proc. Indian Acad. Sci., Ser. B.*, **6:** 414.

Last seen: 1937 (73 years): Only from the original description based on a single specimen.

Type locality: "Kempholey, Hassan", Karnataka", 13°03' N, 75°53' E, 880 m a.s.l.

Type: Holotype, CCB, LOST.

Notes: Neotype designation is necessary to redefine this species and assess its validity and distribution.

IUCN status: Data Deficient (DD).

26. Original name: *Rana* (*Discodeles*) *tenuilingua*; Original Publication: Rao, 1937, *Proc. Indian Acad. Sci., Ser. B.*, **6:** 397.

Last seen: 1937 (73 years): Only from the original description based on a single specimen.

Type locality: "Kemphole Ghats, Hassan, Mysore, South India", 13°03' N, 75°53' E, 880 m a.s.l., Karnataka, India.

Type: Holotype, CCB, LOST.

Notes: Neotype designation is necessary to redefine this species and assess its validity and distribution.

IUCN status: Data Deficient (DD).

27. Original name: *Philautus shyamrupus*; Original Publication: Chanda and Ghosh, 1989, *J. Bombay Nat. Hist. Soc.*, **86:** 215.

Last seen: 1983 (27 years): Only from the original description of five specimens.

Type locality: "Hornbill, Namdapha Tiger Reserve and proposed Biosphere Reserve, 27°32' N, 96°26' E, 585 m a.s.l., Arunachal Pradesh", India.

Type: Holotype ZSI (KZ 313), Paratypes ZSI (KZ 314-317).

Notes: Examination of the type specimens indicates that this species is closely related to *C. vittatus*.

IUCN status: Data Deficient (DD).

28. Original name: *Ixalus chalazodes*; Original Publication: Gunther, 1876, *Proc. Zool. Soc. London*, **1875:** 574.

Last seen: 1874 (136 years): Only from the original description based on a single specimen.

Type locality: "Travancore", 08°15'-09°15' N and 76°32'-77°03' E, 0-880 m a.s.l.

Type: Holotype, NHM 1947.2.6.35.

Notes: Type specimen registered at NHM in 1874 (collected one or more years before description).

IUCN status: Critically Endangered (CR); Extinct (Biju and Bossuit, 2009).

29. Original name: *Ixalus flaviventris*; Original Publication: Boulenger, 1882, *Cat. Batr. Sal. Coll. Brit. Mus. Ed.* **2:** 105.

Last seen: 1874 (136 years): Only from the original description based on ten specimens.

Type locality: "Malabar", from approximately 09°00'-16°5' N.

Type: Lectotype, NHM 1947.2.26.98 (ex BMNH 1874.4.29.1202)

Notes: Type specimen registered at NHM in 1874 (collected eight or more years before description). Ten specimens in the original type series consist of several species, thus a lectotype was designated for the species based on one of the syntypes (Bossuyt and Dubois, 2001)

IUCN status: Data Deficient (DD); Extinct (Biju and Bossuyt, 2009).

30. Original name: *Ixalus jerdonii*; Original Publication: Günther, 1876 "1875", *Proc. Zool. Soc. London*, **1875:** 575

Last seen: 1872 (138 years): Only from the original description based on one specimen.

Type locality: "Darjeeling", approximately 27°02' N, 88°10' E, 2130 m a.s.l., West Bengal, India.

Type: Holotype, NHM 1872.4.17.172.

Notes: Type specimen registered at NHM in 1872 (collected four or more years before description)

IUCN status: Data Deficient (DD).

31. Original name: *Polypedates jerdonii*; Original Publication: Gunther.

1876"1875", *Proc. Zool. Soc. London*, **1875:** 571.

Last seen: 1872 (138 years): Only from the original description based on two specimens.

Type locality: "Darjeeling", approximately 27°02' N, 88°10' E, 2130 m a.s.l., West Bengal, India.

Type: Lectotype, NHM 1947.2.7.84

Notes: Type specimen registered at NHM in 1872 (collected four or more years before description)

IUCN status: Data Deficient (DD)

32. Original name: *Megalophrys kempii*; Original Publication: Annandale, 1912, *Rec. Indian Mus.*, **8:** 20

Last seen: 1912 (98 years): Only from the original description based on a single specimen.

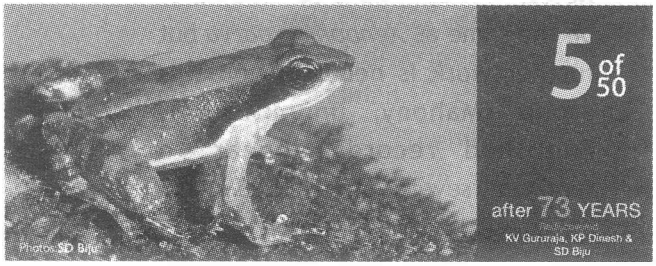
Type locality: "Upper Rotung (2,000 ft.)", 28°08' N, 95°12' E, 610 m a.s.l., Arunachal Pradesh, India.

Type: Holotype, ZSIC 17013.

Notes: The type specimen is badly dehydrated and requires the collection of fresh material to redefine the species morphologically and assess its validity in relation to congeners.

IUCN status: Data Deficient (DD).

ELEGANT TORRENT FROG: *Micrixalus elegans*



33. Original name: *Rhacophorus microdiscus*; Original Publication: Annandale, 1912, *Rec. Indian Mus.*, **8:** 13.

Last seen: 1912 (98 years): Only from the original description based on a single specimen.

Type locality: Kobo, at base of Abor foot-hills (alt. 400 ft.)", 27°46' N, 95°22' E, 122 m a.s.l., currently located in Assam, India.

Type: Holotype, ZSIC 16924.

Notes: The collection of new material is necessary to verify current generic designation.

IUCN status: Data Deficient (DD).

34. Original name: *Ixalus montanus*; Original Publication: Gunther, 1876 "1875", *Proc. Zool. Soc. London*, **1875:** 574.

Last seen: 1876 (134 years): Only from the original collection.

Type locality: "Kudra Mukh at an elevation of 6000 feet", 13°12' N, 75°16' E, 1600 m a.s.l., Karnataka, India.

Type: Lectotype: NHM 1947.2.6.14.

Notes: Currently in synonymy of *Raorchestes tinniens* (Bossuyt and Dubois, 2001).

IUCN status: Not evaluated.

35. Original name: *Philautus sanctisilvaticus*; Original Publication: Das and Chanda, 1997, *Hamadryad*, **22:** 21.

Last seen: 1962 (48 years): Only from the original description based on three specimens.

Type locality: "Kapildhara Falls, Amarkantak (23°10' N, 81°70' E), ca. 190 km SE Jabalpur City, Shahdol, Jabalpur District", Madhya Pradesh, India.

Type: Holotype, ZSIC A1778.

Notes: Though the species described in 1997, the type series was collected in 1962.

IUCN status: Critically Endangered (CR).

36. Original name: *Philautus sahai*; Original Publication: Sarkar and Ray, 2006. In: Alfred (Ed.), Fauna of Arunachal Pradesh, Part 1: 303.

Last seen: 1988 (22 years): Only from the original description based on two specimens.

Type locality: "North bank of Noa Dihing River, c. 10 km. north of Gandhigram, Changlang district", Arunachal Pradesh, India.

Type: Holotype, ZSIC A8500; Paratype, ZSI A8501.

Notes: Specimens collected in 1988 (18 years before the original description).

IUCN status: Data Deficient (DD).

37. Original name: *Philautus terebrans*; Original Publication: Das and Chanda, 1998. *J. South Asian Nat. Hist.*, **3:** 105.

Last seen: 1983 (27 years): Only from the original description based on seven specimens.

Type locality: "Peddavalasa" 17°47' N; 82°16' E, ca. 1,000 m a.s.l., Visakhapatnam, Andhra Pradesh, India.

Type: Holotype, USNM 239428.

Notes: Though the species was described in 1998 the collection of the holotype was in 1983 and paratypes in 1877.

IUCN status: Data Deficient (DD)

38. Original name: *Phrynoderma moloch*; Original Publication: Annandale, 1912, *Rec. Indian Mus.*, **8:** 18.

Last seen: 1912 (98 years): Only from the original description based on two specimens.

Type locality: "Upper Renging, Abor country", 655 m a.s.l., 28°30' N, 95°00' E, Arunachal Pradesh, India.

Type: ZSIC 16951-52.

Notes: The collection of new material is necessary to verify current generic designation.

IUCN status: Vulnerable (VU).

39. Original name: *Xenophrys monticola*; Original Publication: Günther, 1864, *Rept. Brit. India*, **414.**

Last seen: 1860 (150 years): Only known from the original description based on two specimens.

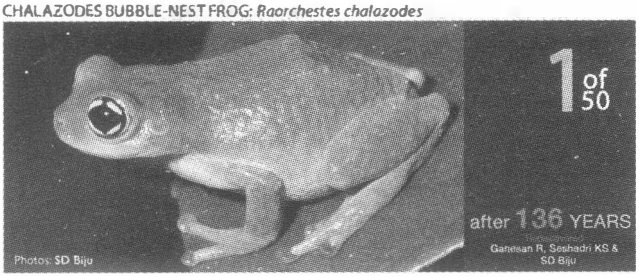
Type locality: "Sikkim and from Khasya" 27°45' N, 88°30' E, and 25°07'-26°00' N, 89°40'-92°09' E, Meghalaya, India, respectively.

Type: NHM 60.3.19.1336.

Notes: This species is considered to be the same as *Xenophrys parva* but further work is necessary on this group (Mahony, unpublished). Published records appear to represent several different species.

IUCN status: Not evaluated.

CHALAZODES BUBBLE-NEST FROG: *Raorchestes chalazodes*



40. Original name: *Scutiger occidentalis*; Original Publication: Dubois, 1978, *Senckenb. Biol.*, **59:** 164.

    Last seen: 1977 (33 years): Only from the original description based on 89 specimens.

    Type locality: "un torrent sous le village de Shukdhari, 2920-2940 m, près de Sonamarg, Cochemire" Jammu and Kashmir, India.

    Type: Holotype: MNHNP 1977.1069, by original designation.

    Notes: This species was reported by numerous authors prior to its description under different names. It is now considered locally extinct in Ladakh by Vasudevan *et al.* (2002, *Frogleg*, **10:** 1-2). Currently considered a synonym of *Scutiger nyingchiensis* Dubois (1987) Alytes, 5: 19).

    IUCN status: Not evaluated.

41. Original name: *Ichthyophis husaini*; Original Publication: Pillai and Ravichandran, 1999, *Rec. Zool. Surv. India. Occasional Paper*, **172:** 36.

    Last seen: 1983 (27 years): Only from the original description based on a single specimen.

    Type locality: "Thebronggiri Coffee Garden, Rongram, Garo Hills", 25°37'03" N, 90°14'11" E, 506 m a.s.l., Meghalaya, India.

    Type: Holotype, ZSIS 18426.

    Notes: It was collected by A. Husain in 1983 and described by Pillai and Ravichandran in 1999.

    IUCN status: Data Deficient (DD).

42. Original name: *Ichthyophis longicephalus*; Original Publication: Pillai, 1986, *Rec. Zool. Surv. India*, **84**: 231.

    Last seen: 1979 (31 years): Known from the original description based on a single specimen.

    Type locality: Silent Valley, 11°13' N, 76°28' E, 1050 m a.s.l., Kerala, India.

    Type: Holotype, VAG 1056 ZSIM.

    Notes: An additional specimen was collected by Pillai in 1985, but it cannot be said with certainty if the second specimen belongs to the same species.

    IUCN status: Data Deficient (DD).

43. Original name: *Uraeotyphlus interruptus*; Original Publication: Pillai and Ravichandran, 1999, *Rec. Zool. Surv. India.* Occasional Paper, **172:** 60.

    Last seen: 1992 (18 years): Only from the original description based on two specimens.

    Type locality: "Chengalam Village", 09°35" N, 76°29" E, 506 m a.s.l., Kerala, India.

    Type: Holotype, ZSI/SRS VAG 14; Paratype, ZSI/SRS VAG 15.

    IUCN status: Data Deficient (DD).

44. Original name: *Cecilia malabarica*; Original Publication: Beddome, 1870, *Madras Monthly J. of Medical Sci.* **2:** 175.

Last seen: 1870 (140 years): Only from the original description based on a single specimen.

Type locality: "Malabar", from approximately 09°00"-16°50" N.

Type: Holotype, NHM 1874.4.29.181.

IUCN status: Data Deficient (DD).

45. Original name: *Uraeotyphlus menoni*; Original Publication: Annandale, 1913, *Rec. Indian Mus.* **9:** 301.

Last seen: 1913 (97 years): Only from the original description based on a single specimen.

Type locality: "...the southern part of the Malabar Zone, . . . Trichur in Cochin", between 08°15' - 09°15' N and 76°32' -77°03' E, Kerala, India.

Type: Holotype, ZSIC 16707.

IUCN status: Data Deficient (DD).

46. Original name: *Uraeotyphlus oommeni*; Original Publication: Gower and Wilkinson, 2007, *Herpetologica*, **63:** 401.

Last seen: 1987 (23 years): Only from the original description based on one specimen.

Type locality: "Bonaccord", 08°40' N, 77°10' E, 800 m a.s.l., Thiruvananthapuram, Kerala, India.

Type: Holotype, BNHS 4178.

Notes: Specimens collected in 1987 (20 years before the original description).

IUCN status: Data Deficient (DD).

47. Original name: *Caecilia oxyura*; Original Publication: Duméril and Bibron, 1841, *Erp. Gen. Hist. Nat. Comp. Reptiles.* **8:** 280.

Last seen: 1841 (169 years): Only from the original description based on two specimens.

Type locality: "Côte du Malabar", from approximately 09°00'-16°50' N, India.

Type: MNHNP 4271.

IUCN status: Data Deficient (DD).

Join the Search, Though in High Time

The search to find lost amphibians is still on. The search to build a team is also on. Around 50 amphibian species (including frogs and caecilians), described as recently as 18 years ago and as far back as 169 years, have eluded researchers in the field. The question is "Are they really extinct or have we not looked hard enough?" The search to answer this question is really an adventure in field biology.

The good news is that the "Lost! Amphibians of India" programme is building the first list of people interested in joining expeditions to search for lost amphibians. If you are interested in inclusion on the list of potential people, or have any queries about the programme, please email your name (as an individual or institution) to lostamphibians@gmail.com or log on to the website: www.lostspeciesindia.org

Acknowledgement: The material used in the article is with courtesy to the websites: http://www.prnewswire.com and http://www.deccanherald.com

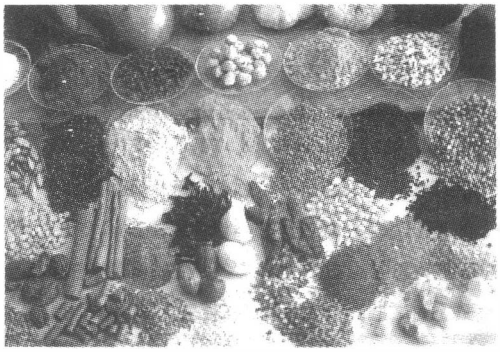
Team Science India

Role of Herbs and Spices in Cancer Therapy

Dr. V. Madhavachandran, P. Yuvaraj, Therasilin Louis, Nishanth Gopinath and S.J. Rekha

Herbs are used for medicinal purpose for ages in various ancient cultures world over. Herbs are also used as flavour enhancing agents in various culinary.The rising prevalence of chronic diseases world-wide and the corresponding rise in health care cost is propelling interest among researchers and public for these herbs for multiple health benefits, including a reduction in cancer risk and modification of tumour behaviour. Recent studies have shown that many herbs and spices show significant multiple anticancer characteristics. This review focuses on the anti tumorigenic property of various herbs and spices and their ability to influence carcinogen bio-activation and likely anticancer contributions.

Cancer is a general term applied for a series of malignant diseases that may affect different parts of body. These diseases are characterized by a rapid and uncontrolled formation of abnormal cells, which may mass together to form a growth or tumour, or proliferate through out the body, initiating abnormal growth at other sites. If the process is not arrested, it may progress until it causes the death of the organism. The main forms of treatment for cancer in humans are surgery, radiation and drugs (cancer chemotherapeutic agents). Modern medicine attributes most cases of cancer to changes in DNA that reduce or eliminate the normal controls over cellular growth, maturation, and programmed cell death.



Types of Cancer in Biological System

There are different types of cancer and the most common ones are as follows:

- **Cancers of Blood and Lymphatic Systems:** a) Hodgkin's disease, b) Leukemias, c) Lymphomas, d) Multiple myeloma and e) Waldenstrom's disease
- **Skin Cancers:** Malignant Melanoma
- **Cancers of Digestive Systems:** a) Oesophageal cancer, b) Stomach cancer, c) Cancer of pancreas, d) Liver

cancer, e) Colon and Rectal cancer, and f) Anal cancer

- **Cancers of Urinary system:** a) Kidney cancer, b) Bladder cancer, c) Testis cancer, and d) Prostate cancer
- **Cancers in women:** a) Breast cancer, b) Ovarian cancer, c) Gynaecological cancer, and d) Choriocarcinoma
- **Miscellaneous cancers:** a) Brain cancer, b) Bone cancer, c) Carcinoid cancer, d) Nasopharyngeal cancer, e) Retroperitoneal sarcomas, f) Soft tissue cancer, and g) Thyroid cancer

One of the defining characteristics of cancer is the loss of controlled growth regulation. Tumorigenesis can be activated by environmental carcinogens, inflammatory agents and tumour promoters which modulate transcription factors, anti-apoptotic proteins, pro-apoptotic proteins, protein kinases, cell cycle proteins, cell adhesion molecules and growth signalling pathways. Many herbs have the potential to influence, modify and rectify tumorigenesis. Herbal medicines in treatment of cancer as complementary and alternative therapy are accepted increasingly with growing scientific evidences of biomedical research and clinical trials.

Historically, herbs have enjoyed a rich tradition. Herbal medicine was used by various cultures for prevention and cure of diseases. Archaeologists discovered evidences dated as early as 5000 BC showing that humans used the leaves of plants for flavouring food and to treat diseases. Early records like Vedas indicate that herbal medicines were used against various diseases by mankind sinceearlier era. Some other records indicate that herbs and spices were used as medicine in ancient Egypt and Assyria and as food preservative in ancient Rome and Greece.

Anti-cancer drugs discovered from herbal medicines have a long history and some of them have been used in clinical setting as the conventional anti-cancer drugs. Actually herbal medicines are a source for anti-cancer drug discovery and drug development. Recently researches continuously focus on clues from traditional use of herbal medicines to develop new anti-cancer drugs in single pure compounds. Secondary plant metabolites like polyphenols occurring in vegetables, fruits, herbs, spices, tea, beer and wine play an important role in cancer chemoprevention. There is also a lot of experimental evidences showing that polyphenols sensitize tumour necrosis factor-related apoptosis inducing ligand resistant cancer cells.

Many herbs have the potential to influence, modify and rectify tumorigenesis. Herbal medicines in treatment of cancer as complementary and alternative therapy are accepted increasingly with growing scientific evidences of biomedical research and clinical trials.

Today many ethnic cuisines are recognized for their reliance on "signature" herbs and spices. Turmeric, coriander, garlic, chilli, pepper, rose mary, ginger, sage, star anise, fennel, fenugreek and celery are commonly used in Indian cuisine. Basil, garlic and oregano are used in Italian and Greek cuisines. Lemongrass, ginger, cilantro and chilli peppers are widely used in Thai food. There are some reports that the cuisines of Asia, South East Asia and the Mediterranean are perceived by many to be healthier than the typical Western diet. The meta analyses indicated that cancer risk at various sites were associated with intake of fruits and vegetables. Individuals who consumed more meat, salted fish, cold cuts and seasoned cheese had the highest risk for gastric cancer, while those consuming more fresh fruit, raw vegetables, onion, garlic and spices were associated with lower risk. In Asian countries, the consumption of spices, fruits and vegetables along with low meat intake, have been reported to be factors linked to a lower incidence of colon cancer.

Similarly many herbs are reported to be endowed with very high curative properties. Indian, Chinese, Tibetan and Arabian treatises are well documented and are being effectively practiced. Offlate several experimental studies and to a lesser extent, clinical trials have also emphasized the role of herbs in the treatment of a variety of disorders. Several herbs and herbal extracts have been shown to possess anti-bacterial, anti-fungal, vermicidal, anti-inflammatory and anti-rheumatic activities. Similarly, some others are proven to have anti-hyperglycaemic, hepato-protective, anti-oxidant, immuno-stimulant and anti-cancer properties.

Herbs in general are believed to be safe and several studies have found them to be non-detrimental and beneficial to gastric mucosa and have cytoprotective properties. It had been reported that certain herbs including spices contain protective factors that possess anti-cancer potential. The prominent mechanism of protective action is mediated by their anti-oxidant activity and the ability to scavenge reactive oxygen. A variety of herbs such as clove, cinnamon, oregano, black pepper, turmeric, ginger and polygonum species are known to contain phyto constituents with anti-oxidative potential. Anti-oxidative constituents of source of the herbs are summarized in Table 1.

Table 1. Anti-oxidant constituents of herbs

Herbs	Anti-oxidant constituents
Clove, all spices	Pimentol and biflorin
Many herbs including clove, cinnamom and oregano	Phenolic acids, phenolic diterpenes, flavonoids and phenolic volatile oils
Black pepper	Piperine
Turmeric, ginger, *Psoralea corylifolia* and Indian spices in general	Curcumine, mehtoxy phenols and dehydrogingerdione backuchiol
Polygonum species, spring onion, broccoli, orange, carrot and ginger	Phenolic compounds, flavonoides, phenolic acids and their derivatives, tannins, stilbenes and anthraquinones
Rosmarinus officinalis and *Salvia officinalis*	Phenolic diterpenes
Andean species and *Sanicula graveolens*	Phenolic, flavonoid and chlorogenic acid and neochlorogenic acid
Human diet species, aromas, essential oils and traditional medicine	Phenylpropanoids (phenolic compounds)
Piper nigrum, Piper umbellatum and *Piper guineense*	Poly phenolic

Compounds in various herbs appear to influence Phase I and Phase II enzymes. *In vitro* and pre-clinical studies using animal models indicate that herbs and spices potentially affect carcinogen bio-activation. Phase I enzymes have an important role in the activation of procarcinogens; equally important in disease prevention are the Phase II enzymes which are involved in the body's natural detoxification process and in drug metabolism and excretion. Some Phase I cytochrome P_{450} enzyme may activate pro-carcinogens to carcinogens. At the same time some other cytochromes may assist with carcinogen removal from the body - CYP expression does vary between individuals, due in part to genetic mutations, polymorphisms and influence of environmental factors. Likewise, polymorphism in Phase II enzymes and altered gene expression patterns of these enzymes are related to the response to food components and may therefore influence cancer risk.

A lot of cancer patients take herbal medicines together with chemotherapy. The benefits of such practices and the potential for side effects resulting from such concurrent use of these two different treatment modalities requires physicians

Table 2. Bioactive food components in commonly used culinary herbs and spices

Herbs/Spices	Bioactive food components
All spice (*Pimenta dioica*)	Eugenol
Basil (*Ocimum sanctum*)	Eugenol, apigenin, limonene, ursolic acid, methyl cinnamate, 1,8-cineole, ∝-terpinene, anthocyanins, β-sitosterol, carvacrol, cintronellol, farnesol, geraniol, kaempherol, menthol, coumaric acid, quercetin, rosmarinic acid, rutin, safrole, tannin, catechin
Cardamom (*Elettaria cardamomum*)	Limonene, caffeic acid
Caraway (*Carum carvi*)	Carvone, limonene, ∝- pinene, kaempferol
Cinnamon (*Cinnamomum zeylanicum*)	Cinnamic aldehyde, 2-hydroxycinnamaldehyde, eugenol
Cloves (*Eugenia caryophyllata*)	Eugenol, isoeugenol, gallic acid
Coriander (*Coriandrum sativum*)	Quercetin, caffeic acid, cineole, geraniol, borneol, 1,8-cineole, ∝-terpinene, β-carotene, β-pinene, β-sitosterol, cinnamic acid, ferrulic acid, γ-terpinene, kaempferol, limonene, myrecene, p-coumaric acid, p-cymene, quercetin, rutin, vanillic acid
Cumin (*Cuminum cyminum*)	∝-pinene, β-pinene, γ-terpinene, p-cymene, cuminaldehyde, carvone, 1,8-cineole, β-carotene, β-sitosterol, caffeic acid, carvacrol, carvaol, geranial, kaempferol, limonene, p-coumaric acid, quercetin, tannin, thymol
Dill (*Anethum graveolens*)	Carvone, limonene, isorhamnetin, kaempferol, myricetin, quercetin, catechin
Fennel (*Foeniculum vulgare*)	∝-pinene, β-carotene, limonene, quercetin, benzoic acid, β-sitosterol, caffeic acid, cinnamic acid, ferulic acid, fumaric acid, kaempferol, myristicin, 1,8-cineole, p-coumaric acid, quercetin, rutin, vanillic acid, vanillin
Garlic (*Allium sativum*)	Allicin, diallyl disulfide, allyl isothiocyanate
Ginger (*Zingiber officinale*)	Zingiberone, zingiberene, ingeol, paradol, curcumin shagoal
Lemongrass (*Cymbopogon citratus*)	Farnesol, geraniol
Licquorice (*Glycyrrhiza glabra*)	Glycyrrhizin
Marjoram (*Origanum majorana*)	Eugenol, limonene, ursolic acid, 1,8-cineole,

	∝-pinene, ∝-terpinene, carvacrol, farnesol, geraniol, p-cymene, rosmarinic acid, sterols, thymol, apigenin
Mustard (*Brassica juncea*)	Allyl isothiocyanate, β-carotene
Nutmeg (*Myristica fragrans*)	Caffeic acid, catechin
Onion (*Allium sativum*)	Quercetin, dipropyl disulfides
Oregano (*Origanum vulgare*)	Apigenin, lutelin, myricetin, quercetin, caffeic acid, p-coumaric acid, rosmarinic acid, carvacrol, thymol
Parsley (*Petroselinum crispum*)	Apigenin, luteolin, kaempferol, myricetin, quercetin, caffeic acid
Pepper, Black (*Piper nigrum*)	Piperidine, piperine, limonene, pinene, ∝-pinene
Pepper (*Capsicum annuum*)	Capsaicin, tocopherol, lutein, β-carotene, ascorbic acid, Vitamin E
Peppermint (*Mentha piperita*)	Limonene, menthol, eriodictyol, hesperitin, apigenin, luteolin
Rosemary (*Rosmarinus officinalis*)	Carnasol, carnosic acid, cineole, geraniol, pinene, β-carotene, apigenin, limonene, naringin, luteolin, caffeic acid, rosmarinic acid, rosmanol, vanillic acid
Saffron (*Crocus sativus*)	Crocetin, crocin, β-carotene, safranal, all trans retinoic acid
Sage (*Alangium salvifolium*)	∝-pinene, β-sitosterol, citral, farnesol, ferulic acid, gallic acid, geraniol, limonene, cineole, perillyl alcohol, β-carotene, catechin, apigenin, luteolin, saponin, ursolica acid, rosemarinic acid, carnosic acid, vanillic acid, caffeic acid, thymol, eugenol
Tarragon (*Artemisia dracunculus*)	Luteolin, isorhamnetin, kaempferol, quercetin, caffeic acid
Tea, Green (*Camellia sinensis*)	(-) Epigallocatechin gallate, (-) epigallocatechin, (-)-(+) catechin, theophylline, gallic acid, theanine
Thyme (*Thymus vulgaris*)	Thymol, carvacrol, cineole, pinene; apigenin, β-carotene, eugenol, limonene, ursolic acid, luteolin, gallic acid, caffeic acid, rosmarinic acid, carnosica acid, hispidulin, cismartin
Turmeric (*Curcuma longa*)	Curcumin, curcumioniods

to be aware of the risks and benefits that may arise. Possibility of herb-drug interaction also will have to be studied. Evidence based studies should be undertaken to document the positive and negative effects of the concomitant use of herbs with anti-cancer chemotherapeutic drugs. Some commonly used culinary herbs and spices and examples of bioactive food components are given in Table 2.

Carcinogenesis is a multi step process which could be prevented by herbal drugs from dietary plants and other plant sources. Phyto-chemicals can prevent cancer initiation. Although radiotherapy is commonly used for a variety of cancers, that alone does not achieve a satisfactory therapeutic outcome. There are many papers published on the effect of various herbs which can enhance the anti-cancer effects of ionizing radiation in melanoma.

Table 3. Anti-cancer plants and its active constituents

S. No.	Botanical name	Family	Common name	Active constituents
1	*Allium sativum*	Liliaceae	Garlic	Alliin, allicin alliin, alliinase, S-allylcysteine(SAC), diallyldisulphide(DADS), diallyltrisulphide (DATS) and methylallyltrisuphide
2	*Actinidia chinensis*	Actinidiaceae	China gooseberry, Kiwifruit	Polysaccharide known as "ACPS-R"
3	*Aloe ferox, Aloe barbadensis*	Liliaceae	Aloe vera	Aloe-emodin, emodin, aloinacemannan
4	*Ananas comosus*	Bromeliaceae	Pine apple, Ananas	Bromelain
5	*Angelica sinensis*	Umbelliferae	Angelica	Polysaccharide fraction of known as "AR-4"
6	*Annona* species	Annonaceae	Monkey species	Acetogenins
7	*Arctium lappa*	Compositae	Burdock	Potent anticancer factors
8	*Astragalus membranaceus*	Papilionaceae	–	Swainsonine
9	*Betula utilis*	Betulaceae	Bhojpatra	Betulin
10	*Camellia sinensis*	Theaceae	Tea plant	Epigallocatechin gallate
11	*Catharanthus roseus*	Apocynaceae	Vinca	Vinblastine, vincristine, alstonine, ajmalicine and reserpine
12	*Chlorella pyrenoidosa*	Oocystaceae	–	Lysine
13	*Colchicum luteum*	Liliaceae	Colchicum	Colchicines demecolcine
14	*Combretum caffrum*	Combritaceae	–	Combretastatin

15	*Curcuma longa*	Zingiberaceae	Turmeric	Tumerone, curcumine.
16	*Echinacea angustifolia*	Asteraceae	Black Sampson	Arabinogalactan, Jucogalactoxyloglucans
17	*Fagopyrum esculentum*	Polygonaceae	-	Amygdalin, rutin
18	*Ginkgo biloba*	Ginkoaceae	Kew tree	Ginkgolide-B, A, C and J
19	*Glycine max*	Leguminosae	Soyabean	Zinc, selenium, vitamins (A, B1, B2, B12,C, D, E and K), amino acids,isoflavones, protease inhibitors,saponins and phytosterols
20	*Glycyrrhiza glabra*	Leguminosae	Liquorice	Glycyrrhizin
21	*Gossypium barbadense*	Malvaceae	Raw cotton	Gossypol
22	*Gyrophora esculenta*	Umbilicariaceae	Mushroom	Polysaccharides β-glucans, ∝-glucans, and galactomannans.
23	*Lentinus edodes*	Agaricaceae	-	lentinan
24	*Linum usitatissimum*	Linaceae	Flax seed, Linseed	Cynogenetic glycosides, Lignans
25	*Mentha* species	Labiateae	Pudina	Monoterpene ketones
26	*Ochrosia elliptica*	Apocynaceae		Ellipticine and 9-methoxy ellipticine are pyridocarbazole (monomeric indole) alkaloids
27	*Panax ginseng*	Aralaceae	Ginseng	Ginsenosides, Panaxosides
28	*Picrorrhizha kurroa*	Scrophulariaceae	Picrorrhiza (kutki)	Picrosides I, II, III and kutkoside
29	*Podophyllum hexandrum*	Berberidaceae	Podophyllum	Podophyllin, astragalin
30	*Taxus brevifolia*	Taxaceae	Pacific yew	Taxanes, taxol cepholomannine
31	*Withania somnifera*	Solanaceae	Ashwagandha	Withanolides, withaferin
32	*Zingiber officinale*	Zingiberaceae	Ginger	Curcumin, gingerenone A, gingeols,shogaols, zingerone

A list of the commonly used anti-cancer drugs are given in Table 3.

Conclusion

The basic mechanisms of cancer therapy are: 1. Inhibiting cancer cell proliferation directly by stimulating macrophage phagocytosis and enhancing natural killer cell activity, 2. Promoting apoptosis of cancer cells by increasing production of interferon, interleukin-2 immunoglobulin and complement in blood serum, 3. Enforcing the necrosis of tumour and inhibiting its translocation and spread

More attention to exposures needed to bring about a biological effect and how susceptibility factors including nutrient-nutrient interactions and genetics influence a response is indicated.

by blocking the blood source of tumour tissue, and 4. Enhancing the number of leukocytes and platelets by stimulating the haemopoietic function. Herbal therapy can play a vital role in enhancing the efficacy of these conventional methods by making use of anti-cancer, anti-oxidant, immuno-modulatory and immuno-enhancing properties. Herbal therapy in prevention as well as cure of cancer can also play a supplementary and/ or a complementary role.

But several issues surface when trying to unravel the health significance of herbs and spices. The lack of commonly accepted terminology, variation in the quality and quantity of secondary metabolites due to climatic as well as genetic variation of plants, lack of standardized spice and herb extracts and preparations, a high degree of variability in the description of herbal and spice products used in studies, along with inconsistent and limited information on the chemical profiles or active ingredients, and the dearth of clinical interventions raise significant concerns about what is and what is not known. Nevertheless, the evidence to date with herbs and spices is intriguing and warrants greater attention. More attention to exposures needed to bring about a biological effect and how susceptibility factors including nutrient-nutrient interactions and genetics influence a response is indicated. The identification of biomarkers of exposure, effect and susceptibility will be crucial in identifying those who will benefit most from herbs and spices.

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Dr. V. Madhavachandran, P. Yuvaraj and Therasilin Louis
Experimental Pharmacology Unit
Nagarjuna Herbal Concentrates Ltd.
Kalayanthani
Thodupuzha, Kerala
E Mail: research@nagarjun.com

Nishanth Gopinath and S.J. Rekha
SISODIA Educational, Medical and Charitable Society
Kollakadavu P.O.
Chengannoor
Alappuzha, Kerala

Sand Dunes of The Thar Desert

Dr. B.S.V. Prakash

A visit to a desert is always fascinating as it unfolds gradually with various habitats such as sand dunes, rocky, mountains, gravel, sandy plains, salty areas with unique type of vegetation patterns etc. Sand dune topography and habitat features are prominent when compared to other desert features.

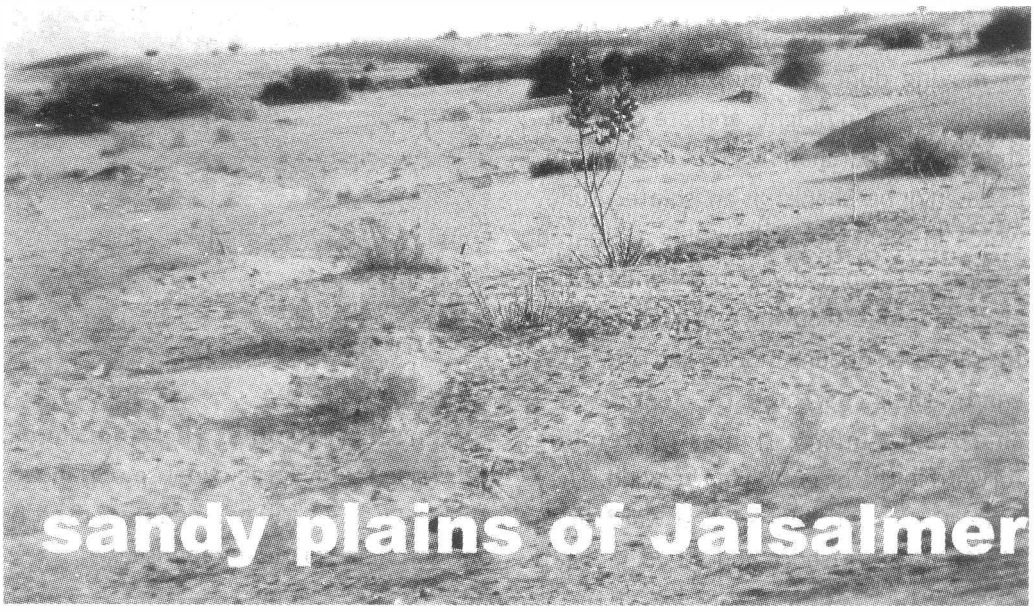
Thar Desert

The great Indian desert, the Thar, which lies in the desert belt of the world, is hot and inland type. Unlike other deserts of the world, it is most populous both in terms of men and livestock. More than 55% of this desert is under sand dunes of different types, origin and magnitude. Besides, other harsh desert environmental condition, sand movement and poor nutrient status are major characteristic features of the dune environment. The sand dunes being mobile are least covered with plants comprising of psamophytic scrubs. In a desert a close relationship exists among the habitats and the vegetation patterns. The compelling need of desert reclamation and the global efforts towards the arrest of desertification are infact, directed largely towards resolving an apparent contribution of essentiality of water for plant life and its general shortage in arid areas.

Haloxylon salicornicum

Sand dune topography and habitat factors

An accumulation of the sand in huge mass in the sand hill, shaped by wind is known as sand dune or sand hill. Locally, it is called 'Dhoa', 'Dhor' or 'Tiba'. They are classified according to their shape and size by various workers. The winds are real sculplors that form the dunes. In Rajasthan, the dominant direction of the wind is from south west to north east. In the summer season, an average wind speed varies from 12 to 14 kmph in eastern parts and 20-30 kmph in western parts and it is highest in the months of May and June. In the winter season direction changes from northeast to southwest. Wind perform two kinds of erosional work. Loose partilces lying upon the ground surface may be lifted into the air or rolled along the ground. This process is deflation, and where the wind dries sand and dust particles against an exposed rock or soil surface, causing it to be worn away by the impact of particles, the process is abrasion.


sandy plains of Jaisalmer

Movement of sand is always an important factor in arid zones. Three process; suspension, saltation and surface creep, are important for the movement of dune sands. Saltation is the most important process for transporting sand grains of 0.06 to 0.25 mm size. The impact velocity required for the movement of dune sand is 4 kmph at a height of 1 cm which is equivalent to 16 kmph at a meter height. About 90% bulk transport of sand is due to saltation process.

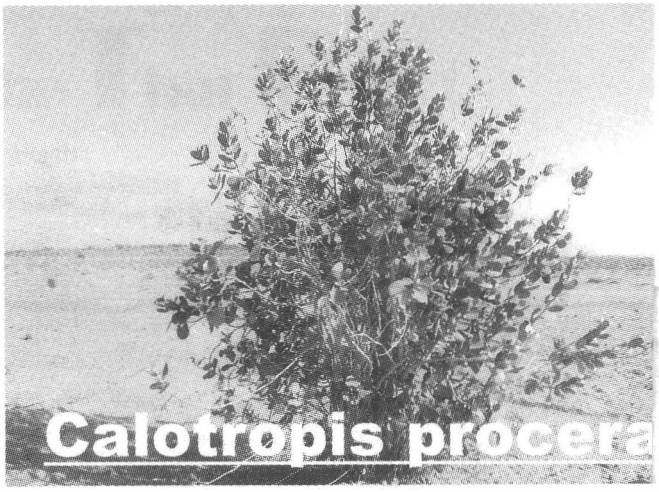
In dry season over sandy plains, strong, turbulent winds lift great quantities of fine dust into the air, forming dense, high cloud called as dust storm. Dust storm approaches as a great dark cloud extending from the ground surface to heights of several thousand feet. Within the dust cloud deep gloom or even total darkness prevails, visibility is cut to a few yards, and a fine chocking dust penetrates everywhere.

Crest is the topmost portion, slope is the middle portion and foot is the base of the dune. The area between two successive dunes is called as dunal valley. Some sunken shady spots between dunes are called as swales or interdunal depressions. The gentle slope of dune (windward) is directly in the path of the prevailing wind, while the steep slope of a dune (leeward side or slip face) is protected from the wind. Sand accumulate at the crest of a dune until it exceeds the angle of repose, then a layer of sand slides down towards leeward side. The author observed big trees growing on the leeward side of the transverse dune, indicating that the dunes have been stabilized for a considerable time.

Mainly, three types of dunes were observed in Thar. *viz.* (a) barchan, (b) longitudinal, and (c) transverse.

Barchan Dunes: In central Thar, barchans or moving dunes develop and they are usually 2-3 m in height, and are crescent-shaped. The barchan (also spelled barcan, barkhen or barchane), is an isolated dune, which in plain view resembles a blunted crescent. The broadly rounded ends of the crescent point to downwards and indicate the direction of dune motion and prevailing winds. Their characteristic features are sharp extremities (wings) extending forward in the direction of the wind. They have a long and gentle wind ward slope (10-15°), and a short and steep leeward slope. The steepness of the latter is determined by the natural angle of response of the dry sand, and usually does not exceed 32-33°. At the point of transition from the gentle to the steep slope a sharp crest is formed, crescentic in plan, which constitutes the highest part for the barchan. Sand grains fall or slide down the steep face after being blown free of the crest. When a strong wind is blowing, the flying sand makes a perceptible cloud at the crest. The term "smoking crest" has been used for this feature.

Transverse Dunes: Where sand is so abundant and that it completely covers the ground, dunes take the form of wave like ridges separated by trough like furrows. The dunes are called transverse dunes because their crests extend at right angles to the direction of wind. The entire area may be called a sand sea, for it resembles a storm-tossed sea suddenly



frozen to immobility. The term "erg", referring to any large expanse of dunes in the Sahara Desert, has been adopted by geographers for such a landscape.

Longitudinal Dunes: The dunes ridges run parallel with the wind direction. They are usually only a few feet high, but may be several km long. But it is in the Sahara, where trade winds persistently blow in one direction and the ridges are up to a million years old, that they attain the greatest hight, being some times hundred meters high. Longitudinal dune ridges, oriented parallel with dominant winds, occupy vast areas of central Australia referred to as sand-ridge desert.

Parabolic Dunes

These belong to the group in which the curve of the dune crest is bowed convexly downwind; the opposite of the curvature of creates in the branches and transverse dunes. These may be described as parabolic in form. Parabolic dunes are generally stabilized, U-or-V-or hair pin shaped dunes.

Complex Dunes

In the vast deserts of North Africa, Arabia and southern Iran are large, complex dune forms apparently not represented in the United States. One of these, is Seif dune, or Sword dune, which has a huge tapering sand ridge whose Crestline rises and falls in alternate peaks. Another Saharan type is the Star dune or Pyramidal dune or Heaped dune, a great sand hill whose base resembles many pointed arms of star in plan. Radial ridges of sand rise towards the dune center culminating in a sharp peek as high as 100 m or more above the base. Star dunes seem to remain fixed in position for centuries and can serve as a reliable landmark for desert travelers.

Sand Hummocks

These Dunes are up to 5 to 8 m high, of irregular shape and anchored by vegetation. The explorers of Central Asia, proved that hummocky sand have formed as a result of the anchoring of sand by desert vegetation possessing certain specific features: rapid apical growth and numerous adventitious roots which make the sand mass coherent. Sandy hummocks are particularly high around Tamarix shrubs.

Dune Environment

Besides, other harsh desert environmental conditions, sand movement, and poor nutrient status are major characteristic features of dune environment. The white sand dunes of southern New Mexico and the Kopi dunes of south Australia are composed of nearly pure gypsum. Quartz sand is a common dune mineral, but the sand dunes near Yuma, Arizona are rock fragments of variable composition. Low moisture availability is commonly perceived to be a characteristic feature of sand dunes. However, there is substantial anecdotal evidence as well as some experimental data demonstrating that the sand dunes are relatively mesic environments for plants in arid region.

Plant Life

In desert, plant life show particularly intimate relation between land, form and plant growth. The significance of land form is primarily due to their controlling influence on the moisture regime. The plantless dune locally called as 'Okhali' type dunes in extreme part of the Thar desert in Jaisalmer district, are concentric dunes composed of fresh sand deposits. The field surveys revealed that most of the dune fields of Thar desert are partially stabilized and a few fields are well stabilized. Barchan type dunes are the most dominantly distributed of the above mentioned area. However these dunes are distributed almost as isolated patches. It can be concluded from the

In desert, plant life show particularly intimate relation between land, form and plant growth. The significance of land form is primarily due to their controlling influence on the moisture regime.

present findings that barchan type dunes are characteristic dune areas of Indian desert. These dunes are observed in Churu (Bisau), Nohor, Shergarh (Balser) and Jaisalmer (Sam). The dunes are surrounded by human settlements (locally called 'Dhanis'). It was found that the Okhali type of dunes appear to be completely stabilized by exotic and indigenous plant species. However, a few barren mobile sand hills located in Sam (Jaisalmer) and Bisau (Churu) are probably left as tourist attractions.

About 80 percent land of Jaisalmer district which is the heart of the desert, is dominantly covered by sandy undulating plains, sandy buried pedioments, sand dunes and international plains. The dominant plant of this region is *Lasiurus sindicus,* commonly called as King of the desert grass. The large tussocks of *L. sindicus* are the main causes for the development of shrub-coppice dunes. It was observed that the *Lasiurus* tussocks (apparently dried) are reduced to small cushion like mounds probably due to intensive grazing and severe drought- desert conditions.

Desert tourism is gradually picking up in Rajasthan. It is a good and healthy way of looking revenue for tourism industry. However, a few precautions need to be considered to save dunes from human activities which disturbs the dune ecosystem. Carrying water bottle is required in dunes but dumping off empty plastic bottles in dunes should be avoided strictly. Some dunes are required to be marked for preservation of natural ecosystem and be restricted for visitors. These tussocks are so abundant, that they are able to occupy all sandy plains, international and some of the dunal areas.

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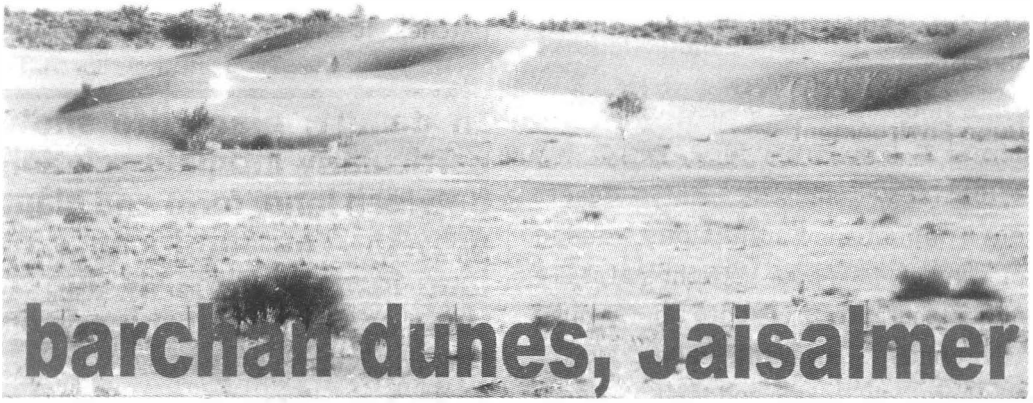
By keeping above investigations in view, it can be concluded that the mobile sand dunes are not dominant and majority of the dunes are well stabilized by exotic and indigenous plant species (*Acacia tortils*, *Acacia senegal* etc.).



barchan dunes, Jaisalmer

Sand Dune Vegetation Cover

Indian desert vegetation is largely characterized by short-lived annual species (Therophytes - 65%) which grow during most favorable condition of moisture. Besides this, there are low growing under-shrubs, creepers (14.0%) and a few tree species (5.5%). The general opinion on the physiognomic aspect of desert is poor, scanty, widely dispersed xerophytic vegetation, leaving large, area bare. Fortunately, most of the desert areas are not completely devoid of any vegetation. The field survey conducted in various parts of the desert in drought prevailing conditions revealed that the desert area is occupied by some vegetation or the other, however sparse it may be. By considering the various existing patterns of vegetation in surveyed sites, it can be concluded that each site has its peculiar dominant vegetation distribution. In general, the sand dunes areas are demarcated vegetationally by *Calligonum* type of vegetation. But in present vegetation *Calligonum polygonides* is completely absent in some of the sand dune areas like Shergarh, Osian and Bhikamkore. However, the presence or absence of *C. polygonides* was made as an important criterion for the demarcation of arid and semi-arid climatic regions of the Thar desert. It appears that this species has merely disappeared from the region during the last one decade or so due to human activities and excessive use of wood as fuel material. There is no general pattern of vegetation specially on sand dune areas of the Thar desert. The plants like *Calotropis procera, Maytenus emarginata, Telcomella undulata, Tephrosia falciformis, Dipterygium glaucum, Clerodendron phlomidis, Leptadenia pyrotechnia, Zizyphus* sp. etc. are distributed in peculiar way at different sites. Some plant species formed just pura population such as *C. procera* at Balesar and Mokal, *T. falciformis* at Sanau (Jaisalmer), *T. undulata* at Bigmi and Chaba, *L. pyrotechnica* at Bisau, and *Zizyphus* sp. at Sanau (Jaisalmer). Some of the plant species found within the valleys are not observed over the top of the sand dunes. Probably the distribution of some plants is controlled by altitude and topography. The distribution of *Capparis decidua*, in general is restricted to sandy plains with deep loose sandy soil. However, the existence of dendroid forms of *C. decidua* on crest portions of Osian dunes showed that, if there are no biotic interferences, the species can occupy any portion of the dune and establish itself. The above stated concept is more clear by the presence of dendroid forms of *C. procera* (Balesar, Bungra, Barabagh), *L. pyrotechnica* (Lathi, Jaisalmer), *C. decidua* (Sriganganagar, Osian) and *C. polyqunoides* (Churu on a dune slope). All the above mentioned plant species are normally found in shrubby forms, in natural habitats. However arid zone plants which survive, develop a tendency of arborescent habit like *Prosopis juliflora* which is a bush when undisturbed, but becomes a tree when its lower branches are cut.

In ancient Indian literature, a perennial Himalayan river named Saraswati has been mentioned flowing in south westerly course between the Yamuna and the Sutlej. The Saraswati is said to have disappeared later in the Indian desert. The strange distribution pattern of the chenopod shrub *Haloxylon salicornium* in the north-west Rajasthan, resembles as if charting the course of dry river bed. It is concentrated in north-west of Indian desert and in south-western part of the Bikaner district. It is restricted to a small area. Widespread distribution of *H. salicornic*um is however recorded in northern parts of the Pokaran and Jaisalmer tehsils of the Jaisalmer district and also in whole of the bordering Barmer district. However, high concentration of this species has been noticed along proposed course of the Indira Gandhi canal specifically from Chinnu to Ramgarh. Contrary to the above reports, the present survey revealed the occurrence of *H. salicornicum* in south of Jaisalmer, Sam, Dhanana and beyond also. The field observations also revealed a fairly large distribution of this species. However, the distribution of *H. salicornicum* gives a clue for the unknown courses river Saraswati, which calls for further studies on the subject.

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Despite poor rainfall, the sand at most of the places is covered by some vegetation and it is not bare at most places. It is a myth that lack of rainfall has ruined the entire vegetation cover. However, these arid zones seem to experience chronic water deficit. Normally any natural ecosystem of sand and dunes regions should show high rate of productivity, in above ground biomass compartment, during rainy season. But in years with low rainfall, seasonal changes are not as remarkable as in normal rainy years. In that case the floristic composition and the density of plants exhibit no wide variation due to the absence of ephemeral plant growth.

Plant Adaptations

The ways and means, which the desert plants employ to adopt themselves are numerous. In a new habitat, after dispersal and migration, the plants face new situation for their future welfare, particularly following climatic fluctuations or biotic interferences. The whole plants as such or its different organs in a unit or separately, try to modify themselves to face the onslaught of changed environment and this is mainly investigated. Such type of adaptions are mainly investigated in the populations of *Crotalaria burhia* and *Tecomella undulata*.

Crotalaria burhia populations are categorized into EB (Erect-bushy) and SS (Suberect-spreading) forms mainly based

on distinct morphological variations. The present classification derives support from the two forms of *Convolvulus microphyllus* Step. ex Spreng.

The compact-prostrate (CP) are more commonly met within the open and the spreading-suberrect form (SS), in protected and shady habitats. The SS form of *C. microphyllus* completely disappeared during summer season. The condensed growth of the EB form helps the plants to withstand the strong desert wind and accumulate sand particles against the danger of uprooting. The perenating roots and its structure observed in *C. burhia* is an extremely interesting example of ecological adaptation. The ribbon-like flattened stem was observed only in EB form during post-monsoonal season. This type of behaviour appears to have a great significance due to considerable reduction in the load of photosynthesis in the plants, and the plants showed normal stem growth towards rainy season. The parahelionasitc movement in the leaves of EB form is another important adaptive feature. Due to this behaviour (leaf movement) leaves can escape the harsh load of heat radiations, which in turn conserve water by avoiding transpiration. By considering the above mentioned adaptive strategies it can be concluded that the population of EB form is drought tolerant and SS form is drought escaping. The EB form is considered as suitable for the arid tracts of Indian desert and it can be concluded from the above mentioned adaptive strategies that the secret of survival mainly depends upon its extraordinary capability to adapt to prevailing environmental conditions. Adaptions have occurred in all extreme environmental conditions so that the plants within that area are better adapted than they were previously, to withstand the conditions of the environment. The present study can be related to one such adaptive strategy displayed by *C. burhia.* In case of *Tecomella undulata* populations, different individual trees produce yellow, orange-red and red coloured flowers. *T. undulata* is the only existing Bignoniaceae member in Indian desert.

The advanced characters like small size of flowers, bright yellow colours of corolla, production of numerous viable seeds, early flowering rhythms, etc. are present in yellow flowered trees. The common characters like distribution on sand dunes and sandy plains and producing flush of flower and viable seeds are attributed to the fact that *T. undulata* is drought tolerant in prevailing desert conditions. Under drought conditions, especially in Barmer district, farmers cut this tree and sell as a last resort of their income. The major drawbacks of this tree are its slow growing nature and curved boles. But it can grow well in regions having low rainfall (even 100 mm) and high temperature during summer. Finally it can be concluded that the tree with yellow flowers are more resistant, advanced and suitable for afforestation of arid zones.

Dr. B.S.V. Prakash
Reader, Department of Botany
Lucknow Christian (P.G.) College
Lucknow - 226 018
E Mail: sylvin1@rediffmail.com

BROAD SPECTRUM CLINICAL UTILITY OF MAHÂVASANTA KUSUMÂKARAM

Dr. L. Mahadevan and Dr. C. Mary Sharmila

Mahâvasanta Kusumâkaram is one of the greatest asset of Siddha medicine which has got multiple components and multidimensional utility. This medicine is prepared by the process of "antar dhûba putam".

- It exhibits properties of a rasâyana (Kalpam). It regulates and maintains a balance of the dosâs, dhâtûs and malâs. Hence it is a rasâyana (Kalpam).
- It has medicinal components which regulate the vitiated state of vâta, pitta and kapha. Hence it can also be used in *sannipâta* conditions (pathological state caused by the combination of the three dosâs).
- It has the property to pacify the toxins in the body (anti-toxic).

A potent rasâyana is one which nourishes the dhâtûs by providing the essential nourishment to the dhâtûs and maintaining the balance of the agni within them. The agni within each dhâtu is represented in each of the seven dhâtûs by the ATP phase. An increase in this agni causes the deterioration of the dhâtûs. Metaphorically speaking a watchful dog in the house of the master, attacks its own master instead of the unwelcomed stranger. This condition is referred to as auto-immunity. For Example, the body is benefitted and not harmed when the agni increases during the convalescence stages of fever and when "*dosa pâkam*" takes place. On the contrary it is harmful when the agni increases at the dhâtu level and "*dhâtu pâkam* "takes place (auto immune process).

In the normal functioning of the dosas (physiology), and the balanced state of the dhâtûs (anatomy), elimination of the metabolic waste of the biochemical response of the body has to be established by the human beings, this state of being is attributed to the healthy life style of an individual. Besides, the understanding of the spiritual inner elements and the increased virtue (Satvam) in mind are also required essentials. This state of both mental and physical well being is the state of complete and healthy wealthy being.

- Mahâvasanta Kusumâkaram has *nâbhi* (*Aconitum ferox*) as one of its active components, which has the property to pacify toxins. Copper also exerts the same effect. The action is as follows.

For three dosâs

- Vâtam – Thanga parpam
- Pittam – Muthu parpam
- Kapham – Gandaka parpam

At the level of dhâtûs

- For rasa (plasma) - Thanga parpam
- Raktam (circulatory system) – Loha bhasmam (Aya parpam)
- Mâmsam (muscles, neuromuscular) – Svarnamâksika bhasmam (Ponnimilai parpam)
- Medas /kolupu (fat, adipose tissue, hormones) – Velvanga parpam
- Asthi (bone, cartilage, tooth) - Muthu parpam
- Majjai – Gandaka parpam (bone marrow, grey matter, white matter, myelin sheath)
- Sukram – Abraka bhasmam (reproductive system)

The inclusion of the drugs in the medicine are present on the basis. Hence it resembles a complete broad spectrum drug.

The extracts of *senggazhuneer poo* (*Pontederia vaginalis*) and *thamarai* (*Nelumbo nucifera*) which are used to grind the medicines are those which have the property to stabilize pitta (pitta samanam).Why should these drugs be pitta samana? A drug is to work as a rasâyana and it should control auto immunity and should have the gunâs of cold and oil. So this medicine is prepared using drugs which have the above mentioned gunâs.

The bio availability of the medicine for quick absorption is obtained by the inclusion of the *kasthûri* (Musk) and *kunkuma poo* (*Crocus sativus*) which increases the plasma half-life as well as the self-life of the finished drug. The valid period of the medicine also increases. It can be mentioned that there is no expiry date for the rasavâta medicines when drugs of the above mentioned nature are added.

Basically, Mahâvasanta Kusumâkaram is a drug commonly handled in kapha conditions. Perhaps one or two tablets can be utilized in various other pathological ailments also. For Example:

- In bipolar mood disorder when given along with (*sangu poo kasâyam*) the kasâyam of *Clitoria ternatea*, it acts as a mood stabilizer.
- Epilepsy

The medicine can be given for epilepsy, though not much of a promise for all types of epilepsy. Practically it exerts a very good effect for the temporal lobe epilepsy. The medicine is given along with buffalo's milk. It has manda guna. A low graded agni (*mandâgni*) exists in kapham. Kapham has manda guna, hence it is not given in kapha conditions, rather given in pitta conditions. A good form of agni persists in pittam. The agni is required for the digestion of buffalo's milk. Hence, it cannot be given in kaphavâta dominant conditions. In vâtam, agni is erratic and irregular or unstable in state.

For buffalo's milk to be given as a catalytic medicine, it requires the condition of disturbed sleep and vâta features to be present. Hence

the medicine fulfills its purpose when given for the pitta type of epilepsy i.e., temporal lobe epilepsy.

- It can be given along with *ellavangapattai* (*Cinnamomum zeylanicum*) for dysmennorrhoea (*sûthaga vâyu*). Practically, the terminology of *sûthaga vâyu* can be compared to endometriosis, spasmodic dysmennorhoea, etc. Since being a rasâyana medicine, it is given to treat infertility in women. The best outcome can be obtained when given along with *ellavangapattai* for ovulation.

- In myoclonus, the vâta is in vitiated state which produces symptoms of contraction and relaxation. Mahâvasanta Kusumâkaram is given with *nochiyelai kasâyam and chukku kasâyam* (*Vitex negundo* and *Zingiber officinale*) in myoclonus.

- In conditions of spasmodic colon, Mahâvasanta Kusumâkaram is given along with *yavaksâram* or *padigaaram*, which acts as a prokinetic agent and antacid to achieve the required management.

- Two tablets of Mahâvasanta Kusumâkaram is given along with 3 gms of *kârpogilarisi cûrnam* (*Psoralea corylifolia*) for skin disorder (kustam). Since better drugs are available for kustam, the philosophy of action is not elaborated.

- This is not the drug of choice for the initial stages of jaundice. To treat jaundice, firstly, the medicines with bitter taste are chosen for purgation and then later sweet taste like *drâksâdi* are given in the form of rasâyana. In cirrhosis of liver, which is caused by vâta and a condition in which rasâyana has to be given, two tablet of Mahâvasanta Kusumâkaram is given along with one teaspoon of *Karisalai cûrnam* (*Wedelia chinensis*)

- For pându it is combined with *triphala cûrnam*. The visualization of pâòdòu should not be confined to its categorization as anaemia, rather includes a wide range of pathological conditions. To treat conditions like hypothyroidism, vitiligo, metabolic syndrome x and many more, the concept of pându can be adopted for treatment. The states of increased kapham in the rasa dhâtu is pâòdòu. This can be termed *dhâtu mandam*. Since a similar treatment is mentioned for both pându and sobai, triphala which is processed in cow's urine is given along with Mahâvasanta Kusumâkaram. Pându and sobai are kapham related pathologies. Triphala and cow's urine reduces kapham. Hence the processed triphala works on this conceptual grounds.

- When given along with *inthuppu* (rock salt) and *thipilli* (*Piper longum*), it is potentiated to stimulate mandâgni. Thipilli has pungent taste, inthuppu is a salt. Salt has the characteristic feature of acting on glands. In conditions, when there is accumulation of vâta in the intestines, the first taste to be given is salt. So, when inthuppu is given, the agni is stimulated and anorexia is overcomed. But due to the availability of better, simple and cost effective medicines like *vayu cûrnam* for anorexia, Mahâvasanta Kusumâkaram is not the choice of drug in these situations

but it is given in chronic dyspepsia, when endoscopy results are negative and still anorexia persists (used in chemotherapy induced dyspepsia.

- It is given with three grams of *nellikkai cûrnam* (*Emblica officinalis*) and three grams of *sivathai cûrnam* (*Operculina turpethum*) for the management of chronic peptic ulcer along with *nellikkai nei* and honey. The proportion of *nellikkai nei* and honey should be unequal when given in this form, it acts like H_2 antagonist to cure peptic ulcer.
- It can be given along with *kaataathi poo kasâyam* (*Woodfordia fruticosa*) *kaataathi poo* has astringent taste. It reduces pitta kapha and cures peptic ulcer. Besides curing the ulcers, it also subsides the pain in the affected regions.
- For dysuria and urethritis two tablet of Mahâvasanta Kusumâkaram is given along with *vellari vithai kasâyam* (*Cucumis sativus*) and 500 mg of *karpûra Silâjit*
- Practically, it is considered the best medicine for diabetic neuropathy, when given with *seenthil kasâyam* (*Tinospora cordifolia*)
- For non-bleeding haemorrhoids it is given along with *kodiveli kasâyam* (*Plumbago zeylanica*)
- For AIDS, Motor Neuron Disease, two tablet of Mahâvasanta Kusumâkaram is given with 5gms of *thaettrankottai cûrnam* (*Strychnos potatorum*)
- It is given with *melagu cûrnam* (*Piper nigrum*) for pyrexia of unknown origin.
- It is given with *asvaganda cûrnam* (*Withania somnifera*) for vâta predominant ailments like motor neuron diseases

Mahâvasanta Kusumâkaram is a medicine which regulates and stabilizes the three dosâs, the seven dhâtûs and the three malâs. It manifests its effect on the various systems of the body, i.e., digestive, respiratory, endocrine, nervous systems, psychiatric conditions, dermatological, neo-natal pathology and infertility management. Due to its varied clinical utility, it can un-doubtfully be termed as a broad spectrum rasâyana medicine. Besides all these the field of utilization of the medicine is also best considered.

It has to be remembered that if the medicine does not produce the desired clinical effects as mentioned in the texts without proper purification of the body firstly, the purification of the dosâs, then the cleansing of malâs and lastly the nourishment of the dhâtûs should take place. Keeping this in mind medicines like Agasthiar kuzhambu are chosen for cleansing, before administering Mahâvasanta Kusumâkaram. The importance of the medicine is emphasized, acknowledging its utility in day-to-day clinical studies, whose effectiveness has given immense satisfaction to us.

Dr. L. Mahadevan and Dr. C. Mary Sharmila
Dr. Y. Mahadeva Iyer's Sri Sarada Ayurvedic Hospital
Derisanamcope – 629 851
Kanyakumari Dist.
Tamil Nadu
E Mail: mahadevan101@gmail.com,
panchakarma101@yahoo.co.in
Website: www.sarada-ayurveda.com

SCIENCE OF THE MONTH

N.S. Arun Kumar

SEPTEMBER 2011

September 1: Leading institute for basic research and training in physical and biophysical sciences, Saha Institute of Nuclear Physics has signed a collaboration agreement with the European Organization for Nuclear Research (CERN). The agreement between the two institution would establish an operational framework for collaboration on scientific projects of common interests that will include the experiments at the Large Hadron Collider (LHC) and the facility for experiments with radioactive nuclear beams and Grid computing. Saha Institute is the only institute from India to participate in the experiments at CERN. Link: http://www.saha.ac.in

September 2: Assam will carry out an adult vaccination programme for *Japanese encephalitis* (a disease caused by the mosquito-borne Japanese encephalitis virus) in Sivasagar district on an experimental basis from October this year. It will be undertaken to assess the effectiveness of vaccines to prevent an outbreak in the district. It is for the first time in the country that such a vaccination programme was being undertaken. The state health department will incur all expenses in this regard and over ₹ 72 crore will be spent for operational costs alone. Vaccination for those below 15 years is already there in the state. Link: http://www.who.int

September 3: Vultures are an ecologically vital group of birds that face a range of threats in many areas that they occur. Populations of many Vulture species are under pressure and some species are facing extinction. Today, the world observed the International Vulture Awareness Day. It is organised internationally by the Birds of Prey Programme in South Africa and the Hawk Conservancy Trust in England. From mid-1990s, population of Vultures in India and world-over suffered a sudden and significant decline due to the use the veterinary anti-inflammatory drug, Diclofenac. It is hoped that the Day can publicise the conservation of vultures to a wider audience. Link: http://www.vultureday.org

September 4: Two Delhi students have made history by discovering a new asteroid as part of a unique astronomy project connected to US space agency NASA. The duo will also get an opportunity to name the asteroid. Vaibhav Sapra and Sharanjeet Singh, Class 12 students of Bal Bharati Public School in Pitampura, discovered a main belt asteroid (2011 QM14). It was part of the All India Asteroid Search Campaign (AIASC). About 60 schools from across India participated. Asteroids are very small planet-like objects that generally go around the Sun in orbits located between Mars and Jupiter. Sometimes these are nudged by gravitational forces out of their orbits and can come into contact with Earth.Link: http://balbharatipp.org

September 5: Indian Space Research Organisation (ISRO) plans to build a new class of powerful communication satellites that packs more capacity and new technologies. This kind of spacecraft would handle larger amount of power and accommodate more number of transponders in the same satellite. ISRO planns to incorporate new technologies in them and get into higher bands. ISRO would launch its first navigation satellite next year, under its Indian Regional Navigation Satellite System (IRNSS) programme which would be followed by six more such spacecraft. ISRO's GSLV today can carry satellites weighing 2.2 tons into space. GSLV-Mk III will be one of the "major targets" in the coming five-year plan. Link: http://www.isro.org

September 6: The green anole lizard (*Anolis carolinensis*),a native of the Southeastern United States, is the first reptile to have its genome sequenced.The researchers performed the first analysis of several other unusual features in the Anole genome, including microchromosomes, found in reptiles, amphibians, and fish but never in mammals. They also found a complete lack of Isochores, regions of the genome with high or low concentrations of the nucleotides "G" (Guanine) and "C" (Cytosine) which give human chromosomes a distinct banding pattern.The researchers who completed this sequencing project reported their findings in the journal *Nature*. Link: http://www.nature.com

September 7: A 120-crore project of the Ministry of New and Renewable Energy, Government of India under the Jawaharlal Nehru National Solar Mission will kick transform the mobile towers in the country into solar powered towers. Of the 400 towers, installed at ₹ 30 lakh each, 100 will be of BSNL. The Ministry will subsidise about 30% of the tower costs. Even at areas where the supply of electricity is erratic, Ministry has planned to construct Solar Photovoltaic (SPV) plants to generate DC electricity, which in turn will get the signals transmitted. By this the country will save up to 260 crore liters of Diesel, saving 1,040 Crore Rupees annually. Link: http://www.mnre.gov.in

September 8: Today is World Physiotherapy Day which presents an opportunity for physiotherapists all over the world to raise awareness about the crucial role their profession plays in making and keeping people well, mobile and independent. It is the day on which the World Confederation of Physiotherapists (WCPT) was founded in 1951. The day marks the unity and solidarity of the physical therapy community from 101 countries around the world. It is an opportunity to recognize the work that physical therapists do for their patients and community. WCPT aims to support member organizations in their efforts to promote the profession and to advance their clinical expertise, using World Physical Therapy Day as a focus. Link: http://www.wcpt.org/wptday

September 9: In a setback to the proposed Athirappilly hydro-electric project, the Western Ghats Ecology Expert Panel (WGEEP), led by environmentalist Madhav Gadgil, recommended to the Union Ministry of Environment and Forests against granting permission to carry out any construction activities at the sensitive Athirappilly-Vazhachal region. The panel designated Athirappilly as one of the 18

eco-sensitive localities (ESL) in the state. The report recommends declaring the entire Western Ghats as an ecologically sensitive area. It also wants the entire Western Ghats to be divided into three ecologically sensitive zones - ESZ 1, ESZ 2 and ESZ 3. ESZ 1 areas should be protected as national parks and bird sanctuaries. Link:http://www.westernghatsindia.org

September 10: Norwegian and Indian scientists have characterized gene sequences in Rohu Carp (*Labio rohita*) and Black Tiger Shrimp (*Penaeusmonodon*). The result will be used to find genes associated with disease resistance. The diseases Furunculosis and White Spot Syndrome Virus (WSSV) have had a dramatic negative impact on aquaculture production of carp and shrimp, both in India and on a global basis. The database of gene sequences contain more than 137,000 gene sequences. The Norwegian-Indian collaborative project which began in 2008, was headed by Nicholas Robinson from Nofima Mat, the Norwegian Institute of Food, Fisheries and Aquaculture Research. Link: http://www.nofima.no

September 11: A study done by the Herpetological Foundation of Sri Lanka has re-elevated the Skink (*Dasia halianus*) to endemic level in Sri Lanka. It was once portrayed in the two rupee note designed by renowned artist Lucky Senanayake which is believed to be based on a drawing which appeared in 'A Coloured Atlas of Some Vertebrates From Ceylon' done by naturalist and scientist Dr. P.E.P. Deraniyagala in 1953. This species of Skink was first described in 1887 in Sri Lanka. However, J. Joshua and A.G. Sekar in 1984 reported in the *Journal of the Bombay Natural History Society* that this Skink was found in a wildlife sanctuary in Tamil Nadu. The present conservation status for *Dasia halianus* in Sri Lanka is 'Near Threatened'.Link: http://threatenedtaxa.org

September 12: The Indian Space Research Organization (ISRO) will launch the Indo-French satellite Megha-Tropiques on October 12 from the Satish Dhawan Space Centre in Sriharikota. The Megha-Tropiques (Megha means cloud in Sanskrit and Tropiques means tropics in French). It will contribute to the precipitation measurement mission and is beneficial to climate research globally. The satellite, which will carry an 'Imaging Radiometer Microwave Analysis and Detection of Rain and Atmospheric Structures' and a GPS Radio Occultation System. Three other satellites, Jugnu and SMRSAT, designed and developed by the IIT-K and SMR University, respectively, and one from Luxembourg will piggyback the satellite. Link: http://www.isro.org

September 13: NASA's twin lunar Gravity Recovery and Interior Laboratory (GRAIL) spacecraft lifted off from Cape Canaveral Air Force Station in Florida to study the moon in unprecedented detail.GRAIL will answer longstanding questions about the moon and give scientists a better understanding of how Earth and other rocky planets in the solar system formed.The straight-line distance from Earth to the moon is approximately 250,000 miles (402,336 kilometers). NASA's Apollo moon crews needed approximately three days to cover that distance. However, each spacecraft will take approximately 3.5 months and cover more than 4 million kilometers to arrive. This low-energy trajectory results in the longer travel time. The science collection phase for GRAIL is expected to last 82 days. Link: http://science.nasa.gov

September 14: Scientists belonging to the Harvard University have made a claim that the universe is also home to two 'alien' planets, which they refer to as being 'invisible'. Named Kepler-19b and Kepler-19c, the existence of these alien planets was first affirmed when NASA's Kepler telescope spotted the Kepler-19b, when it passed in front of its host star. The researchers claim that the discovery of the invisible planets is the achievement of a new technology: Transit Timing Variation. It essentially studies the differences in the brightness of a star resulting out of a planet's movement across itself. The planet, Kepler-19b is being believed to be located almost 650 light years away from Earth, in the constellation, Lyra. Link: http://kepler.nasa.gov

September 15: International Centre for Free and Open Source Software (ICFOSS) launched its open access journal, *Journal of Free Software and Free Knowledge*, today. ICFOSS is an autonomous institution under the Government of Kerala, in order to push the agenda of promoting democratic access to information and knowledge through equitable models of production and distribution of software in particular and knowledge in general. ICFOSS has been registered as a Society. While ICFOSS will eventually be having its own international campus, its operations have begun from its current office premises in Technopark, Trivandrum, Kerala. Submissions for the journal can be made at the web address: http://icfoss.org/ojs

September 16: Over the last few years, there has been a nearly 30 percent reduction in the backwaters of Kerala, perhaps the most picturesque Indian state. This startling revelation was made by Dr. Krishnaswamy Kasturirangan, former Chairman of ISRO and current member of Planning Commission, during a presentation this evening at the Tata Institute of Fundamental Research (TIFR). Besides the Kerala backwaters, satellites have been studying the glaciers in the Himalayan region, revealing that in the past few years there has been a 20 percent loss of glaciers in the Bhagirathi basin of the Gangotri region. India's first astronomy satellite, designated as Astrosat, is slated for lift off either towards the end of 2012 or in 2013. Link: http://meghnad.iucaa.ernet.in/~astrosat

September 17: Indian scientists are calling for a major rewrite of a proposed animal welfare law that could totally change research involving animals. The meeting was held at the Indian National Science Academy (INSA) in New Delhi. The proposed Animal Welfare Act of 2011 aims to strengthen India's overall efforts to prevent animal cruelty and includes provisions covering research. The draft proposal which the government could send to Parliament later this year goes too far. For example, its definition of an "animal" as "any living creature other than human being" does not make it clear, for example, whether it applies to microbes or animals not known to feel pain. Link: http://moef.nic.in

September 18: Scientists at the Govind Ballabh Pant Institute of Himalayan Environment and Development (GBPIHED) have discovered two new species of catfish *Erethistoides senkhiensis* and *Glyptothorax dikrongensis* in the state's rivers. The *Erethistoides senkhiensis* species was captured from the Senkhi stream during samplings carried out between March and June 2006. It was

placed in catfish genera *Erethistoides*, which consists of six species, after consultation of standard literature and compilation of morphometric data. Besides publishing this discovery, 88 species of freshwater fishes have also been assessed and evaluated by the Institute for the Red Data Book for International Union for Conservation of Nature (IUCN). Link: http://gbpihed.gov.in

September 19: The second edition of the free online collaborative Encylopedia of Life (EoL) is launched.The second edition contains more than 600,000 still images and videos. With the new interface, users can find species of interest even more easily. The EoL second edition could help map vectors of human disease, reveal mysteries behind longevity, suggest substitute plant pollinators for a swelling list of places where honeybees no longer provide that service and foster strategies to slow the spread of invasive species. The EoL now aims to build one infinitely expandable page for each species including video, images, sound, graphics as well as text. Link: http://www.eol.org

September 20: A new drug derived from Citrus fruits can help people suffering from Alzheimer's disease to improve their quality of life, claims a researcher of the All India Institute of Medical Sciences (AIIMS). Dr. Mahaveer Golechha, Senior Research Fellow, Department of Pharmacology, AIIMS, who discovered the anti-Alzheimer's potential of Citrus fruits has been awarded the prestigious Alzheimer's Drug Discovery Foundation's, USA Young Investigator Scholarship Award. The drug Naringin is a bioflavonoid. Alzheimer's disease is the most common form of disorders that impairs mental functioning. The work has been published in the *Biological and Pharmaceutical Bulletin*. Link: http://www.jstage.jst.go.jp

September 21: China's second moon orbiter Chang'e-2 has sent back the first batch of data while about 1.7 million km away from Earth. Chang'e-2 will be the first moon orbiter in the world to observe solar winds for a fairly long time around the L2 which is a prime position to study solar winds. Chang'e-2 entered the L2 orbit, where gravity from the Sun and Earth balances the orbital motion of a satellite, in late August and has been operating stably for 26 days. There are five so-called "Lagrange Points" about 1.5 million km from the Earth in the exact opposite direction from the Sun. It is the first time for China to send a spacecraft to a place 1.7 million km away from Earth. Link: http://www.costind.gov.cn

September 22: The Indian Ocean will be investigated from next month to study how tropical weather brews there and moves eastward along the equator, with reverberating effects around the globe. The six-month field campaign, known as DYNAMO or Dynamics of the Madden-Julian Oscillation, will help improve long-range weather forecasts and seasonal outlooks and enable scientists to further refine computer models of global climate. The goal of the DYNAMO field campaign is to better understand the Madden-Julian Oscillation or MJO. MJO originates in the equatorial Indian Ocean roughly every 30 to 90 days, is part of the Asian and Australian monsoons and can enhance hurricane activity in the northeast Pacific and Gulf of Mexico. Link: http://www.eol.ucar.edu

September 23: A 20-year-old NASA satellite crashed to the Pacific Ocean today. The decommissioned satellite crossed eastward and moved over portions of the Indian Ocean and Africa before getting into the final fall. It then most likely disintegrated and scattered debris over a roughly 500-mile stretch across the northern portion of the Pacific.The Upper Atmosphere Research Satellite (UARS) satellite was sent into orbit in 1991 by the space shuttle Discovery to measure the ozone layer.The 35 by 15 foot spacecraft weighs 5,900 kilograms. It was officially decommissioned in 2005. It also urged anyone who comes across what they believe may be space debris not to touch it, but to call authorities for assistance.Link: http://umpgal.gsfc.nasa.gov

September 24: Germany's Max Planck Society, a world leader in basic science research, officially opened a new centre in India on lipids research in collaboration with the National Centre for Biological Sciences in Bangalore. This is Max Planck's second research centre in the country. The Max Planck Centre for Computer Science at the Indian Institute of Technology, Delhi, was opened last year. The new centre aims to boost research in Lipidomics, a branch of molecular biology.Max Planck is a prestigious research organization, with around 80 research institutes in Germany, others elsewhere in Europe and one in Florida in the US. Some 32 Nobel Prizes have been awarded to its scientists over the decades. Link: http://www.mpg.de

September 25: Eleven scientists have been selected for the prestigious Shanti Swarup Bhatnagar Prize for Science and Technology this year. First given in 1958, the country's highest award in science is named after the founder director of CSIR, Shanti Swarup Bhatnagar. It is given to a scientist up to 45 years of age and carries a prize of ₹ 5 lakh. The winners this year include Amit Prakash Sharma and Rajan Sankaranarayanan in Biological Sciences, Balasubramanian Sundaram and Garikapati N. Sastry in Chemical Sciences, Shankar Doraiswamy in Earth, Atmosphere, Ocean and Planetary Sciences, Sirshendu De and Upadrasta Ramamurty in Engineering Sciences, Mahan Maharaj and PalashSarkar in Mathematical Sciences and Kithiganahalli N. Balaji in Physical Sciences. Link: http://csirhrdg.nic.in

September 26: The northern parts of Kerala state are shivering under the grip of Rat fever (Leptospirosis) and the government has activated all the departments concerned to counter the spread of the epidemic. The government decided to launch a massive awareness campaign involving ASHA (Accredited Social Health Activist) workers. It is also decided to conduct a week-long sanitation drive in the state from today involving various voluntary organisations. A total of 126 confirmed cases of Leptospirosis and 14 deaths have been reported from the northern districts, Malappuram, Kozhikode, Wayanad, Kannur and Kasargod, from January till September this year. According to Director of Health Services P. K. Jameela, there has been an increase in the number of cases during the last three weeks. Link: http://www.ncbi.nlm.nih.gov

September 27: Wangari Maathai, the first African woman recipient of the Nobel

Peace Prize, died after a long struggle with cancer at the age of 71. One of Kenya's most recognizable women, Maathai won the Nobel in 2004 for combining environmentalism and social activism. She was the founder of the Green Belt Movement. A former member of Kenya's parliament, Maathai was the first woman to earn a doctorate in East Africa, in 1971 from the University of Nairobi. Maathai first latched on to the idea of widespread tree planting while serving as the Chair of the National Council of Women in Kenya during the 1980s. Link: http://www.greenbeltmovement.org

September 28: The wreck of the 412ft-long *SS Gairsoppa* Ship, owned by the British Indian Steam Navigation Company, was discovered by Odyssey Marine Exploration, an American underwater archaeology firm. Expert underwater archaeologists will attempt to salvage the treasure, handing 20 per cent of its value to the British Government. The *SS Gairsoppa* set sail from India in December 1940 carrying a consignment of 240 tonnes of silver, iron and tea. It was headed for Liverpool but was attacked by the German submarine U101, 300 miles southwest of the Irish harbour. On February 17, 1941, a single torpedo sank the ill-fated vessel and the Second Officer Richard Ayres was the only one who survived. He was awarded an MBE for his attempts to rescue his fellow sailors and lived until 1992. Link: http://www.shipwreck.net

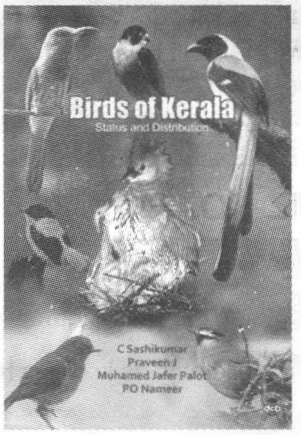
September 29: The latest report released by World Health Organization establishes Ludhiana as the most polluted city in the country. With 251 micrograms per cubic meter of particulate matter (PM) 10, the city reached the top national rank. Following Ludhiana with 209 micrograms per cubic meter is Kanpur, while Delhi ranks third with 198 and Lucknow and Indore with 186 and 174 micrograms per cubic meter PM10, respectively, round off the top five list. Mumbai comes tenth with 132 micrograms per cubic meter of PM10 (particles less than 10 microns), according to the Urban Air Pollution Database released on Monday. The database is the result of studies conducted in 1,100 cities in 91 countries of the world from 2003 to 2010. Link: http://www.who.int

September 30: China will launch its Tiangong-1 ("Heavenly Palace") space module today marking its first step towards building a Chinese Space Station. China consider it to be symbol of its growing technical expertise, and Communist Party's success in turning around the fortunes of the formerly poverty-stricken nation.China would attempt its first space docking between Tiangong-1 and another unmanned vehicle called Shenzhou 8 in the second half of the year. China's space station will be made up of the module, two laboratories, a cargo ship and a manned rocket, with a total weight of 60 tonnes. China became the world's third nation to put a man in space independently-after the United States and Russia-when Yang Liwei became the first Chinese astronaut, in 2003. In September 2008, the Shenzhou-7, piloted by three astronauts, carried out China's first space walk. Link: http://www.cnsa.gov.cn

N.S. Arun Kumar
Support Specialist
'NISH'
Karimanal P.O.
Thiruvananthapuram - 695 583
E Mail: yeyenyes@gmail.com
www.aknscience.blogspot.com

BOOK OF THE MONTH

Birds of Kerala - Status and Distribution



Title	:	Birds of Kerala - Status and Distribution
Author	:	C.Sashi Kumar, J.Praveen, Muhammed Jafer Palot and P. O. Nameer
Publisher	:	DC Books
Pages	:	109
Price	:	Rs. 995
ISBN	:	9788126429219
Available online at:		http://www.dcbookshop.net/books/Birds-of-Kerala

"Birds of Kerala: Status and Distribution" Edited by C. Sasikumar, J. Praveen, Mohammed Jafer Palot and P.O. Nameer provides a consolidated wealth of information on birds of Kerala making it a valuable source of information for bird watchers as well as ornithologists. The accurate checklists and the detailed site information along with the distribution may be helpful for the visiting birders as well. With a lot of focus on conservation and up-to-date status of avian habitats, the book also helps in defining and prioritizing the solidarity among conservation actions.

The book starts with a dedication to KK Neelakandan, the foremost ornithologist of Kerala. Then A Brief History of Ornithology in Kerala is revealed mainly with the help of individual accounts of prominent ornithologists in chronological order. The chapter traces ornithological history since 1751 and gives biographies of 12 ornithologists who worked in Kerala right from T.C. Jerdon (1847-1851) to Michael Jackson (1935-1972) through Salim Ali (1933-1984). It ends with short accounts on diverse birding related topics like Bird-ringing, Books, Surveys, AWC, Nature camps, Bird Photography, Kerala birdere group, Bird Tours etc.

Then follows an excellent chapter on Changing landscape of Kerala which describes the various habitats in Kerala with a special focus on how these are getting affected by recent human interferences. A one page description of Climate of Kerala is followed by another very interesting account of the various bird communities in Kerala based on the habitat. There is still another chapter completely devoted to conservation with details including the list of threatened birds of Kerala, endemic birds, protected areas and important birding sites.

The chapter overview of bird communities of Kerala lists bird communities of the nine biotopes/ habitations: High-altitude shoals and grasslands, Mid-altitude forests in the highlands, Low-altitude forests, riparian forests and Sacred groves, Wetlands, Backwaters, Mangroves, Shores, Islands, Plantations, Drylands including Dry Deciduous, Scrub Jungles and Meadowlands, Villages, Towns, and City Gardens.

The core content of the book, the individual species accounts covers about 462 bird species in the main list and a secondary list of 52 species that have not met the criteria set out for authentication of a sighting or record. Each species account details the present state of knowledge on its habitats, status, distribution,breeding, population changes, migration and historical records.

The secondary list contains historical records, misidentified records, unconfirmed sight recordsand all other information reported from Kerala, but not forming part of the main list for each bird the habitat, status, distribution, breeding and historical references are detailed. Where ever applicable, one or more photographs, the Population Trends, Conservation Related Information and additional notes are also provided. A section of notes is included for certain species to raise important issues concerning taxonomy and distribution of species.

The book also gives an up to date checklist of birds for all the protected areas in Kerala. The compilation of the information on different species presented is quite thorough, that reflects the state of knowledge of the authors who have sought out every source of information on the birds of the region, as reflected in species accounts: Methodology and notes and the additional information provided is as recent as December 2010.

Four Appendices are given: Appendix 1: giving a Comprehensive checklist of 480+ species occurring in 32 sites whose checklists have been whetted by as many site-referees; Appendix II gives details on 19 of Salim Alis's Travancore Cochin Survey locations covered between January-December 1933; Appendix III presents a Glossary of terms used inthe text and the Appendix IV provides Useful birding contacts with in the state; The Scientific and English names of birds that appear in the book are indexed separately.

The section on Bibliography contains a listing of 1166 references (including 47+ from Electronic sources). The most striking feature of the book is that almost all species references are supplemented with photos of good quality which gives life to the Text. The book contains one of the largest collection of photo taken from Kerala. Excellent print quality is also a point worth mentioning.

REVIEW TEXT COURTESY: http://www.surfbirds.com/birdingmail/Mail/BNGBirds/1006234

N.S. Arun Kumar
Support Specialist
'NISH'
Karimanal P.O.
Thiruvananthapuram – 695 583
E Mail: yeyenyes@gmail.com
www.aknscience.blogspot.com

SCIENCE INDIA QUIZ

Send the correct answers to Science India office or to arsmenon@gmail.com/scienceindia2010@gmail.com latest by 20th November, 2011. A science book as prize awaits you. If there are more than one correct entries, the winner will be selected by draw of lots

- Editor

SCIENCE INDIA QUIZ NO. 24

1. Banking of curves on roads is done to provide -------
2. Bone is used as a fertilizer because it contains the plant nutrient -------
3. Sponges or organisms that live attached to solid objects in water belong to the phylum of -------
4. Main component of bones and teeth
5. The acid used in car battery
6. ECG is used for the diagnosis of ailments of -------
7. Planet known as 'Evening Star'
8. This famous computer pioneer was also an opium addict and a gambler
9. This bird is called as the 'Engineer of animal kingdom'
10. Mass per unit volume of a substance

Answers to Quiz No. 22

1. Capillary action 2. Methyl isocynate 3. Chlorophyll 4. Leg 5. Six 6. Water-borne 7. Acid Rain 8. Bat 9. Calculus 10. Delhi

The winner is Master K.P. Rejimon, Govt. High School, Kothamangalam CONGRATULATIONS !!!

Answers to Quiz No. 23

1. Silver 2. Ascorbic acid 3. Amphibians 4. Cerebrum 5. A sulphur compound 6. Gums 7. Acupuncture 8. Batyscaph 9. Calcutta 10. Dendrochronology

The winner is Master Vijayachandran, Govt. High School, Nenmara, Palakkad. CONGRATULATIONS !!!

Contd. from front inner cover

Black-legged Dart Frog

It is the second most toxic frog of the world. You can find this frog in Western Colombia. It is smaller than other frogs. It is also less dangerous than others. But still its poison can kill a human.

Giant Leaf Frog

It is very interesting frog known as monkey frog. It is a very menacing frog. It can become cause of cancer and AIDS and other dangerous diseases.

Lovely Poison Frog

This wonderful poison frog is known as striped poison frog. It is mostly found in Central America. The poison of this frog is low as 0.8 micrograms but can be dangerous for human. It cause heart failure.

Blue Poison Dart Frog

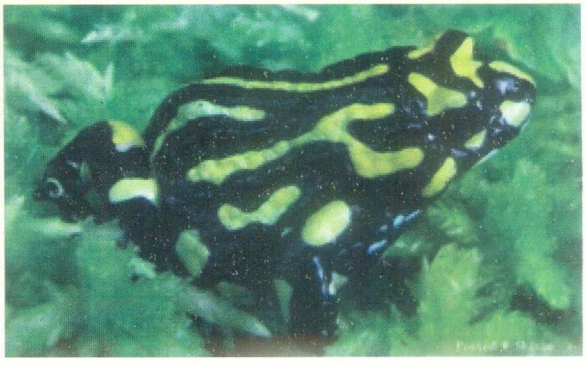
This frog has low quality poison but still it is harmful for humans. It lives at South America. Its 2 micrograms of poison can kill a human easily. It can kill any predator not warned away by its voice and coloring.

Golfodulcean Poison Frog

This wonderful frog is strikingly colored. It contains noticeably less poison.

Corroboree Frog

These dangerous frogs are easily recognizable by their yellow stripes and finds at Australia. This frog can produce poison by itself. They east bugs and insects.



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KERALA
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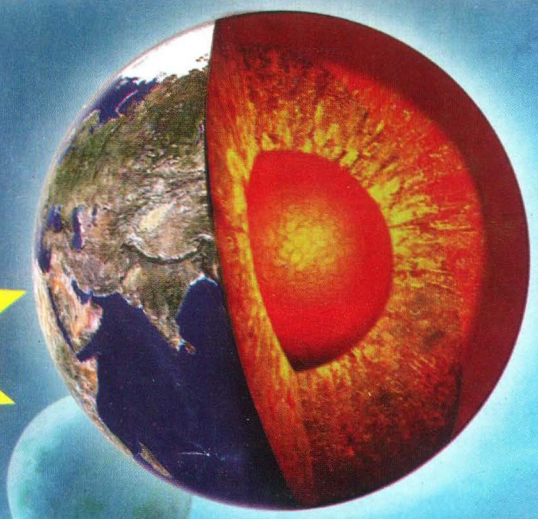

Last date for Registration 15th November 2011

ALL KERALA SCIENCE TALENT CONTEST - 2011

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(A unit of Vijnana Bharati)

B4, 4th floor, Mather Square,Town Railway Station Road, Kochi-682 018, Kerala
Tel : 0484 2393242, Fax: 0484 2393256, Mobile : 9895351015
Email: contact@spmkerala.com , www.spmkerala.com